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L4	((document or sheet or page or paper or film)near2 cover or platen)near4 (surface or side or area or region) near4 (hue or color or chroma$7 or tinct or tint or yellow) and @ad<20001208 and (scan$4 or read$4)	172	L4
L3	((document or sheet or page or paper or film)near2 cover or platen)near3 (hue or color or chroma$7 or tinct or tint or yellow) and @ad<20001208 and (scan$4 or read$4)	695	L3
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L4: Entry 3 of 172 File: USPT Jul 1, 2003

DOCUMENT-IDENTIFIER: US 6587233 B1
TITLE: Removable bicolored platen covers for image capture devices

Abstract Text (1):
A platen cover having a plurality of platen cover surfaces that can be exposed. Each platen cover surface has a different color and/or has a different surface treatment, such as matte, gloss, reflective and the like. The different exposable surfaces are carried on at least one removable platen cover surface that can be detachably attached to the platen cover. To change the exposed surface, the platen cover surface is detached from the platen cover. That platen cover surface can then be rotated to expose a different face of the platen cover surface. Alternately, a different platen cover surface can be installed. In other exemplary embodiments, the platen cover has a plurality of retractable platen cover layers that can be exposed. Each platen cover layer has a different color and/or surface treatment. The quality of many functions that are performed in an image capture device can be improved by using different platen cover colors. Therefore, the platen cover is selected based on the operation being performed or a image capture device user's selection.

Application Filing Date (1):
19991122

Brief Summary Text (5):
Image capture devices read information from an original image to generate electronic data representing the captured original image. The original image is placed on a transparent platen. The transparent platen is covered by a platen cover. Light, from a light source, traverses through the transparent platen and onto the original image. The light reflections and intensities contain information about the original image. This light is usually focused onto the surface of a photosensitive element. There, the light is turned into electrical signals. These signals are then output to a storage device or to an image generating system or device.

Brief Summary Text (7):
During the operation of copiers and other image capture devices, a document is laid on or fed onto a transparent platen and is covered by a platen cover. The platen cover aides in retaining the position of the document on the transparent platen. When copying large or thick documents, such as a book, the platen cover helps to prevent the rays of light from striking the operators' eyes. The platen cover is also used to aid in capturing information, particularly scan and image quality features. These include aiding in determining paper boundaries and size, in background suppression and in photo screening, to detecting colors. Using a different color and/or a different surface for the platen cover can improve each of these scan and image quality features. However, most copiers and other image capture devices only provide a platen cover using a single color, which is usually white.

Brief Summary Text (12):
In various exemplary embodiments of the systems and methods according to this

invention, platen covers of various colors and/or surfaces are provided that correspond to the various scan and image quality features that can be obtained. For example, document size determination works best with a gray platen cover, automatic background suppression and photo screening work best with a white cover, and detecting colors, works best with mirrored surface covers.

Brief Summary Text (13):
In various exemplary embodiments of the systems and methods according to this invention, a removable snap-on platen cover is used to change the platen cover to a desired color and/or surface. The platen cover has different unchangeable colors and/or surfaces on each side. If it is desirable to provide more than two colors and/or surfaces, several interchangeable platen covers that corresponds to the various desired colors and/or surfaces can be provided. In various exemplary embodiments, during an image capture operation, the system can inform the operator of the appropriate platen color and/or surface for that operation. If that platen cover is not already installed, the operator can then easily and quickly change to the appropriate platen cover.

Detailed Description Text (4):
In various exemplary embodiments of the image capture device 100 according to this invention, the platen cover surface 112 is removable. The platen cover surface 112 can be easily removed and snapped back into place. When the image capture device 100 informs the operator that a certain platen cover color is desirable, the operator can easily remove the current platen cover surface 112 having one color and/or surface and replace it with another platen cover surface 112 having a different color and/or surface. Each platen cover surface 112 has two exposable platen cover surfaces, each exposable platen cover surfaces having a different color and/or surface. In some instances it is only necessary to remove the current platen cover surface 112 and flip this platen cover surface 112 over to expose the other exposable platen cover surface. If more than two colors and/or surfaces are desirable to provide appropriate colors and/or surfaces for a larger number of image capturing functions, then several platen covers surfaces 112 can be provided. Each platen cover surface 112 has at least two exposable platen cover surfaces, with a different color and/or surface on each exposable platen cover surface.

Detailed Description Text (6):
In various exemplary embodiments, the image capture device 100 then informs the user, through a display system or the like, of the determined platen cover color and/or surface. The image capture device 100 then enters a waiting mode. The operator can then choose to change the platen cover color and/or surface or to continue operating the image capture device 100 with the current platen cover surface 112. If the determined platen cover color and/or surface is already the exposed platen cover surface 112, the user can input a control signal to advise the controller 160 of the image capture device 100 that the determined platen cover is the exposed color and/or surface of the platen cover surface 112. If the user chooses to change the platen cover surface 112, the user opens the platen cover 110, changes the platen cover surface 112 to expose the platen cover surface 112 of the platen cover 110 having the determined color and/or surface. The user then re-closes the platen cover 110 and inputs the control signal to advise the controller 160 of the image capture device 110 that the exposed color and/or surface 112 of the platen cover 110 is the determined platen cover color and/or surface. The image capture device 100 then performs the selected image capture operation.

Detailed Description Text (7):
In various other exemplary embodiments, each exposable surface 112 of the platen cover 110 is provided with a "keying" device or structure 114 that cooperates with a sensing device or structure 150. The sensing device or structure 150, based on the keying device or structure 114 of the exposed 112 surface of the platen cover 110, outputs a signal to the controller 160 of image capture device 100. This signal informs the controller 160 of the image capture device 100 of the currently

exposed surface 112 of the platen cover 110. If the platen cover surface 112 corresponding to the determined color and/or surface is already in place, then the image capture device 100 proceeds to perform the selected function. If another platen cover 110 is more appropriate for the selected function, then the image capture device 100 will inform the operator, through a display system or the like, of the particular platen cover 110 that is appropriate for the selected operation. The operator can then choose to change the platen cover color and/or surface or to continue operating the image capture device 100 with the current platen cover surface 112.

Detailed Description Text (8):
If the operator chooses to change the platen cover surface 112, the operator opens the platen cover 110, changes the platen cover surface 112 to expose the surface 112 of the platen cover 110 having the determined color and/or surface. Once the operator re-closes the platen cover 110, the controller 160 inputs the signal from the sensor device or structure 150. The image capture device 100 will then inform the operator if the correct platen cover color and/or surface 112 has been exposed. If it is the correct platen cover color and/or surface 112, then the image capture device 100 will proceed with the selected function. If the exposed platen cover and/or surface 112 is the incorrect platen cover color and/or surface 112, then the operator has the option of changing the platen cover color and/or surface 112 or using the exposed platen cover and/or surface 112 already installed.

Detailed Description Text (9):
Once the image capture device 100 has performed the selected function, the operator can then choose to leave the platen cover color and/or surface 112 as is or replace it, so the image capture device 100 is in its original state. In this case, the image capture device 100 is then ready to be used by another operator.

Detailed Description Text (20):
While FIG. 1 shows the image capture device 100 as a separate device from an image data sink, the image capture device 100 may be an integrated device, such as an analog copier, a digital copier, a computer with a built-in scanner, a facsimile machine, or any other integrated device that is capable of producing electronic image data or an electrostatic latent image from an original image. With such a configuration, for example the image capture device 100 and data sink may be contained within a single device. Alternatively, the image capture device 100 may be a separate device attachable upstream of a stand alone image data sink. For example, the image capture device 100 may be a device which interfaces with the image data sink.

Detailed Description Text (21):
In general, the image capture device 100 can be any one of a number of different types of devices, such as a scanner, an analog copier, a digital copier, or a facsimile device that is suitable for generating electronic image data. Thus, the image capture device 100 can be any known or later developed device that is capable of generating image data or an electrostatic latent image by illuminating an original image. In general, the image data sink can be any device that is capable of processing or storing the generates image data generated according to the systems and methods of this invention, such as a printer, a copier or other image forming devices, a facsimile device, a display device, a memory, or the like.

CLAIMS:

14. A method for automatically changing a platen cover color and/or surface of a changeable platen cover having at least two surfaces that can be exposed, each surface having a different combination of color and surface treatment, according to a desired operation of an image capture device, including: determining the desired operation of the image capture device; determining an appropriate one of the at least two surfaces based on the desired operation; and automatically changing the

changeable platen cover to expose the determined surface.

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L4: Entry 19 of 172 File: USPT Oct 24, 2000

DOCUMENT-IDENTIFIER: US 6136043 A
TITLE: Polishing pad methods of manufacture and use

Application Filing Date (1):
19990420

Brief Summary Text (24):
In a simple embodiment of the present invention, a polishing pad made from selected material is dyed on one side in a manner that causes the dye to permeate the pad to a limited depth that does not cause total dyeing of the pad. After dyeing the pad, it is attached to the polishing platen. Polishing begins and slurries are added to the polishing operation. When a color change is noticed, an operator stops the polishing operation and changes the pad. When the pad is dyed only superficially, the dyed side is placed against the platen and the color change from original pad color to the dyed color indicates the end of the useful life of the pad, or where an operator should change the pad so as to avoid an undesireable result from further use of the pad.

Detailed Description Text (43):
In addition to real time monitoring, the dyeing scheme illustrated in FIG. 10 can be used to condition a pad until a known substantially planar surface has been exposed. In the inventive conditioning method, pad 10 is dyed with at least one color upon a surface that is to be affixed to the polishing platen. At least one dye is permeated through the pad in a substantially uniform application such that, when polishing pad 10 is irregular, only the irregular portion and some potential excess of the remainder of the pad remains undyed. In FIG. 10, this irregular portion, and some potential excess of the remainder of the pad, is undyed portion 28. All remaining portions of pad 10 are depicted as first dyed portion 24, however first dyed portion 24 can be a plurality of dyed portions. Each succeeding dyed "slice" of first dyed portion 24 would be shallower than the immediately previous dyed portion, and each succeeding "slice" would be darker so as to distinguish it from all previously dyed portions. Subsequent dyeing operations are normally required to be shallower and darker; non-opaque dyes can combine with previously dyed portions to make mixed colors.

Detailed Description Text (54):
Formation of a polishing pad that contains abrasives fixed throughout the entire pad structure can also be accomplished, and multiple dye layers can be placed within the polishing pad to indicate to the operator the wear of the polishing pad while polishing an article to be polished. The limit of wear layers that can be accomplished in a polishing pad is within the level of skill of the ordinary artisan and can be accomplished by reading the disclosure of the present invention and by practicing the invention as taught herein.

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L4: Entry 30 of 172 File: USPT Oct 26, 1999

DOCUMENT-IDENTIFIER: US 5973797 A
TITLE: Image reading apparatus

Abstract Text (1):
The present invention relates to an image reading apparatus in which a structure is simple and in which the size of a document can be detected in a short time, wherein the levels of signals, which are outputted from photoelectric elements within a plurality of sensing regions on a light-receiving portion of a line sensor correspond to a pair of nearby regions (#1 and #2, #3 and #4, #5 and #6, and #7 and #8) which hold each edge (e.g., edges 64A, 64B, 64C in FIG. 5) of the plurality of documents of different sizes disposed on a platen glass, are compared to a threshold value, or alternatively, the change in the levels of signals which are outputted from the photoelectric elements within a plurality of sensing regions (e.g., #1, #2 and #3 in FIG. 11) continuously cross each edge of the plurality documents of different sizes is obtained in order to determine the size of the document. An optical sensor which detects the existence of the document at a predetermined position (#0) on the platen glass is provided so that when the document is disposed in a transverse direction (SEF), the documents exists, and when the document is disposed in a longitudinal direction (LEF), the document does not exist. Accordingly, the direction of the document is determined. Due to this structure, the size and direction of the document disposed on the transparent member are determined.

Application Filing Date (1):
19970107

Brief Summary Text (3):
The present invention relates to an image reading apparatus, and more particularly, to an image reading apparatus which reads an image recorded onto a document which has been disposed on a plate-shaped transparent member such as a platen glass.

Brief Summary Text (9):
Moreover, after the image recorded onto the document is converted into a digitized image data, it is general that a copying machine (a so-called digital copying machine), which records (copies) the image onto a paper on the basis of the image data, or a facsimile terminal equipment includes a plurality of photoelectric transducing elements such as CCD which are arranged in a line, and that the photoelectric transducing elements read the image of the document by scanning the document. As a result, in this type of apparatus, it has been more widely used that the document is scanned by the photoelectric transducing elements before the image is read (a so-called pre-scan), and on the basis of the signals outputted from the photoelectric transducing elements, the size of the document is detected.

Brief Summary Text (10):
In the aforementioned method of detection, because the size of the document is also detected by the photoelectric transducing elements provided for reading the image, it is not necessary to provide a plurality of new sensors in accordance with the types of documents disposed on the platen glass. However, because it is necessary to pre-scan the document every time the document is disposed, there is a drawback

in that the processing capacity (e.g., the copied number of sheets per unit of time or the like) of the apparatus does not improve.

Brief Summary Text (12):
As a result, in order to improve reliability of the detection of the size of the document, it has been proposed that a surface whose light reflectance is low is formed on the reverse surface of the platen cover, or that the color of the reverse surface of the platen cover is not white (see JP-B No. 62-47026).

Brief Summary Text (14):
Moreover, if the light reflectance of the reverse surface of the platen cover is substantially lowered with respect to the light transmittance of the document whose background is white, when the platen cover is closed and the document is read in the digital copying machine, the portion of the platen glass on which the document is not disposed is recognized as high density (e.g., black). Accordingly, when the image is copied onto the paper simply based on the image data obtained by reading the document, the portion of the copied image which corresponds to the portion at which the document is not disposed becomes solid black. Therefore, it is not preferable.

Brief Summary Text (15):
In order to avoid this, for example, after the pre-scan is effected and the size of the document is detected, the portion of the platen glass on which the document is not disposed is determined on the basis of the detected document size. When the document is read, the signal, which is outputted in accordance with the portion of the platen glass on which the document is not disposed, of the signals outputted from a photoelectric transducer needs to be masked electrically. Alternatively, it is necessary to change automatically input/output characteristic at the time of converting the signals outputted from the photoelectric transducer into the image data so that the density of the portion at which the document is not disposed is 0 (white) on the image data. A drawback arises in that the structure of the apparatus is complicated.

Brief Summary Text (16):
Instead of the above-described method, it has been effected that the reverse surface of the platen cover is a color whose light reflectance is similar to that of white and which is recognized as white by a monochrome copying machine (e.g., yellow). When the document is pre-scanned, an optical filter whose color is complementary to the color of the reverse surface of the platen cover (e.g., dark blue which is complementary to yellow) is inserted before a lens which images the light at the light-receiving portion of the photoelectric transducing element (as a result, the portion of the platen glass on which the document is not disposed is recognized as black), and when the image is read, the above-described optical filter is taken from before the lens. However, in this case, because it is necessary to provide a mechanism for moving the optical filter, there is a drawback in that the structure of the apparatus is complicated after all.

Brief Summary Text (18):
The present invention was developed with the aforementioned in view, and the object thereof is to obtain an image reading apparatus in which a structure is simple and in which the size of a document can be detected in a short time.

Brief Summary Text (20):
On the basis of the above description, the invention according to claim 1 is an image reading apparatus in which a document, which is disposed on a plate-shaped transparent member, is optically scanned by a photoelectric transducer having a plurality of photoelectric transducing elements such that the image which is recorded onto the document is read, comprising: a scanning device which is movable in the direction orthogonal to the photoelectric transducer, the scanning device irradiating light, which is irradiated from a lamp and reflected by reflecting

mirrors, to the photoelectric transducer; a size detector which determines the size of the document which is disposed on the transparent member, on the basis of pixel signals outputted from the photoelectric transducing elements within a plurality of small regions which correspond to the area across each specific edge of a plurality of documents of different sizes which are disposed at substantially fixed positions on the transparent member; and a control portion which is connected to the scanning device and the size detector so as to control the scanning device.

Brief Summary Text (21):
The disposition of the document at the substantially fixed position of the transparent member can be easily realized by providing, for example, guide means such as a registration guide for positioning the two edges of the document on fixed positions. In the invention according to claim 1, because the size of the document is determined by using the photoelectric transducers, which are provided for reading the image recorded onto the document, it is not necessary to provide a plurality of sensors for exclusively detecting the size of the document. Therefore, the structure of the apparatus can be simple.

Brief Summary Text (22):
Further, on the basis of the signals outputted from the photoelectric transducing elements within a plurality of small regions which correspond to the area across the specific edge (the edge at which the position on the transparent member is different in accordance with the size of the document) of each of a plurality of documents of different sizes, the size of the document can be determined by, for example, whether the specific edge of the document is positioned in each area. Accordingly, it is not necessary to move (scan) the area on the transparent member at which each of the photoelectric transducing elements of the photoelectric transducer reads, and the size of the document can be determined in a short time.

Brief Summary Text (25):
As a result, the invention according to claim 3 is an image reading apparatus in which a document, which is disposed on a plate-shaped transparent member, is optically scanned by a photoelectric transducer having a plurality of photoelectric transducing elements such that the image which is recorded onto the document is read, comprising: a size detector which determines the size of the document which is disposed on the transparent member, on the basis of pixel signals outputted from the photoelectric transducing elements within a plurality of small regions which correspond to the area across each specific edge of a plurality of documents of different sizes which are disposed at substantially fixed positions on the transparent member; and detection means which detects the existence of the document at a predetermined position on the transparent member wherein when the document is disposed on the transparent member in a first direction, the document exists regardless of the size of the document, and when the document is disposed on the transparent member in a second direction which is different from the first position, the document does not exist regardless of the size of the document, wherein on the basis of the signals outputted from the photoelectric transducing elements within the plurality of small regions and the results of detection of existence of the document effected by the detection means, the size and direction of the document disposed on the transparent member are determined.

Brief Summary Text (30):
In the invention according to claim 1, the invention according to claim 9 is an image reading apparatus further comprising: a cover which is movable between a position at which the transparent member is shielded and a position at which the transparent member is exposed, wherein before and after the transparent member is shielded by the cover, the size of the document is determined on the basis of the signals outputted from the photoelectric transducing elements.

Brief Summary Text (31):
In a case in which the image read by the image reading apparatus is used for

copying onto a paper, it is general that the cover such as a platen cover is provided so as to be movable between the position at which the transparent member such as a platen glass is shielded and the position at which the transparent member is exposed, and in a state in which the transparent member on which the document is disposed is shielded by the cover, the image which is recorded onto the document is read. In this case, in order to prevent set off to the copied image, it is necessary that the reverse surface of the cover is a low density achromatic color, and more preferably, white.

Drawing Description Text (2):
FIG. 1 is a perspective view showing an appearance of an image reading apparatus relating to a present embodiment.

Drawing Description Text (3):
FIG. 2A is a side view of the image reading apparatus showing a state in which a platen cover is stood up.

Drawing Description Text (4):
FIG. 2B is a side view of the image reading apparatus showing a state in which the platen cover is rotated more than a predetermined angle from the stood-up state and in which an angle sensor is turned on.

Drawing Description Text (5):
FIG. 3 is a cross-sectional view showing a schematic structure of an optical system which is provided at a body of equipment of the image reading apparatus.

Drawing Description Text (6):
FIG. 4 is a schematic block diagram showing a control portion and its peripheral structures of the image reading apparatus.

Detailed Description Text (4):
FIG. 1 shows an appearance of a image reading apparatus 10 relating to the first embodiment. The image reading apparatus 10 includes a box-shaped cabinet 12. A lid-shaped document stand 14 which closes an upper open portion of the cabinet 12 is mounted to the upper portion of the cabinet 12. The document stand 14 includes a rectangular, plate-shaped platen glass 16 which is a transparent member and a rectangular, frame-shaped registration guide plate 18 which is provided at the outer circumference of the platen glass 16. In the first embodiment, the size of the portion of the platen glass 16 which is exposed from the registration guide plate 18 is substantially equal to A3 size.

Detailed Description Text (9):
As illustrated in FIG. 3, a scanning device 32 is provided within the cabinet 12. The scanning device 32 includes a lamp 34 which irradiates light toward the platen glass 16, a first reflecting mirror 36 which reflects reflected light from the platen glass 16 side substantially horizontally, a second reflecting mirror 38 which is disposed at the light irradiating side of the first reflecting mirror 36 and which irradiates the light which is incident from the first reflecting mirror 36 downwardly along the substantially vertical direction, and a third reflecting mirror 40 which is disposed at the light irradiating side of the second reflecting mirror 38 and which reflects the light which is incident from the second reflecting mirror 38 substantially horizontally. Additionally, at the light irradiating side of the third reflecting mirror 40, an imaging lens and a CCD line sensor 44 serving as a photoelectric transducer of the present invention are provided.

Detailed Description Text (10):
FIG. 3 shows a cross-sectional view of the platen glass 16 along a long edge direction thereof. The lamp 34, the reflecting mirrors 36, 38, 40, and the imaging lens 42 are respectively provided from one end of the platen glass 16 to the other end thereof along a short edge direction thereof (the direction normal to the page

surface of FIG. 3: hereinafter, "main scanning direction"). Accordingly, the light, which is irradiated from the lamp 34 to the platen glass 16, and the light, which is reflected by the platen glass 16 side so as to be imaged on the light-receiving portion of the CCD line sensor 44 via the reflecting mirrors 36, 38, 40 and the imaging lens 42, respectively forms a slit-shaped light which is long in the main scanning direction.

Detailed Description Text (11):
The CCD line sensor 44 includes a plurality of cells (photoelectric transducing elements of the present invention) which are arranged at fixed density along the main scanning direction. The amount of light received at each of the position on the light-receiving portion of the CCD line sensor 44 along the main scanning direction is converted into an electric signal by the cell so as to be outputted.

Detailed Description Text (12):
Moreover, the lamp 34 and the first reflecting mirror 36 are mounted to a carriage member 46 which can move reciprocally within the cabinet 12 along a sub-scanning direction (the direction of arrow S in FIG. 3) which is orthogonal to the main scanning direction. The second reflecting mirror 38 and the third reflecting mirror 40 are mounted to a carriage member 48 which can move reciprocally within the cabinet 12 along the same sub-scanning direction. The carriage member 46 is moved along the sub-scanning direction by a carriage member driving portion 50 (see FIG. 4), and the carriage member 48 is moved along the sub-scanning direction by a carriage member driving portion 52 (see FIG. 4). The carriage member driving portions 50, 52 are connected to a control portion 54 so that operations of the carriage member driving portions 50, 52 are controlled by the control portion 54. The control portion 54 includes a microcomputer and the like.

Detailed Description Text (13):
In a case in which the image of the document disposed on the platen glass 16 is read, due to the control portion 54, the carriage member 46 is moved at predetermined velocity along the sub-scanning direction by the carriage member driving portion 50, and the carriage member 48 is moved at half of the above-described predetermined velocity along the direction which is the same as the moving direction of the carriage member 46 by the carriage member driving portion 52. In a case in which the platen cover 24 is closed, the light irradiated from the lamp 34 is reflected by the document 21 which is disposed on the platen glass 16 or by the surface of the platen cushion 26 which is in close contact with the platen glass 16. Consequently, as the carriage members 46, 48 are moved as described above, regardless of the position of the carriage member 46 along the sub-scanning direction, an optical path length from the lamp 34 to the CCD line sensor 44 is constant.

Detailed Description Text (17):
The aforementioned image reading apparatus 10 forms a part of a digital copying machine (unillustrated). The image of a document read by the image reading apparatus 10 is copied onto a paper by the copying machine. The size and direction of the document determined by the image reading apparatus 10 (determination of the size and direction of the document will be described in detail later) are used for selecting a paper or for determining copying magnification.

Detailed Description Text (18):
Next, the operation of the first embodiment will be explained. In a standby state in which the document has not been read or the like (which includes the time during which the size of the document is determined), the control portion 54 controls the positions (so-called home positions) of the carriage members 46, 48 so that the sensing area of the CCD line sensor 44 is about 20 mm inwardly of the borderline region between the registration guide plate 18 and the platen glass 16 along the sub-scanning direction (the hatched area shown in FIG. 5). It is clear from FIG. 5 that the length of the sensing area of the CCD line sensor 44 along the main

scanning direction is slightly longer than the length of the platen glass 16 along the main scanning direction.

Detailed Description Text (23):
FIG. 6 shows conceptually a light-receiving portion of the CCD line sensor 44. In the first embodiment, sensing regions #1 through #8 (a plurality of small regions in the present invention, more particularly, the regions which correspond to the small regions described in claim 5) are determined in advance on the light-receiving portion of the CCD line sensor 44 so as to correspond to the sensing areas #1 through #8 in FIG. 5. The sensing regions #1 through #8 are formed by a plurality of pixels (=cells, as an example, 34 cells in FIG. 6) which are disposed in a row along the main scanning direction. Further, in the first embodiment, the position on the light-receiving portion of the CCD line sensor 44 which corresponds to the position of each edge of documents of various sizes, which crosses the sensing area of the CCD line sensor 44, on the platen glass 16 is converted into the number of pixels (the number of cells) counted from the pixel which corresponds to the first registration position and determined in advance (see FIG. 6).

Detailed Description Text (28):
The CCD line sensor 44 synchronizes the signals from the respective cells with a video clock signal, and repeatedly outputs the signals successively from the cell which is positioned at the end portion side corresponding to the first registration position side along the main scanning direction. As illustrated in FIG. 8, the aforementioned line synchronization signal becomes high at a timing synchronized with which the signal outputted from the cell, which is positioned so as to correspond to the first registration position, is inputted as an image data to the size detection portion 58 via the CCD driver 56. The line synchronization signal is kept high until the signal outputted from the cell corresponding to the second registration position is inputted as an image data to the size detection portion 58 via the CCD driver 56.

Detailed Description Text (44):
Next, a process of determining the size of a document which is effected at the control portion 54 will be explained with reference to flowcharts shown in FIGS. 10A and 10B. The process of determining the document size is carried out in a standby state in which the document is not read or the like. The carriage members 46, 48 are positioned at home positions, and the sensing area of the CCD line sensor 44 is positioned in the hatched area shown in FIG. 5.

Detailed Description Text (48):
When the angle sensor 28 is turned on so that the answer to the determination in step 188 is "Yes", in step 190, the lamp 34 is turned on. In step 192, the process waits for a predetermined period of time (e.g., 20 m/sec.) until the amount of light of the lamp 34 is stabilized. In a subsequent step 194, the hold register is set to "1". As a result, the release of holding of the data which is set to the status register is indicated at the size detection portion 58, and the register reset signal is outputted. In a subsequent step 196, the data which is set to the status register in accordance with the previously-described area sensing process is read. Moreover, in step 198, the hold register is set to "0". As a result, the register hold signal is outputted and the data which is set to the status register is held.

Detailed Description Text (53):
In the above-description, compared to the case in which the size and direction of the document are determined by moving the sensing area of the CCD line sensor 44 along the sub-scanning direction, because the size and direction of the document are determined without moving the sensing area of the CCD line sensor 44, the process is completed in a short time.

Detailed Description Text (62):

As described above, in the first embodiment, because the size and direction of the document are determined on the basis of the CCD line sensor 44, there is no need to provide a plurality of new sensors for detecting the size and direction of the document. Moreover, since the size and direction of the document are determined without moving the sensing area of the CCD line sensor 44, compared to the case of effecting a pre-scan in which the size and direction of the document are determined by scanning the sensing area of the CCD line sensor 44 along the sub-scanning direction, the process is completed in a short time.

Detailed Description Text (65):
Further, in the above description, the sensing start position serving as the position of sensing region is inputted from the control portion 54 to the size detection portion 58. Accordingly, even when the position of the sensing region is changed as the size of the document to be detected is changed, the position of the sensing region can be easily changed by changing the sensing start position which is inputted from the control portion 54 to the size detection portion 58. Therefore, when the size of the document to be detected is changed, it is not necessary to change the position of the sensor or to carry out pre-scan.

Detailed Description Text (72):
FIG. 12 shows conceptually a light-receiving portion of the CCD line sensor 44. In the second embodiment, sensing regions #1 through #3 (a plurality of small regions in the present invention, more particularly, the regions which correspond to the small regions described in claim 7) are determined in advance on the light-receiving portion of the CCD line sensor 44 so as to correspond to the sensing areas #1 through #3 in FIG. 11. The sensing regions #1 through #3 are formed by a plurality of pixels (=cells) which are disposed in a row along the main scanning direction.

Detailed Description Text (84):
As described above, in the second embodiment, because the size and direction of the document are determined without moving the sensing area of the CCD line sensor 44, there is no need to provide a plurality of new sensors for detecting the size and direction of the document. Compared to the case in which a pre-scan is effected, the process is completed in a short time. Also, in the above description, since the differences in the image data from the cells within each sensing area are successively calculated for edge detection, it is not necessary to provide a memory with large capacity or the like.

Detailed Description Text (86):
In the above description, the size of document is determined by using the CCD line sensor 44 which is provided for reading the image of the document. However, the present invention is not limited to this. In an image recording apparatus which records the image of a document onto a recording paper without reading the image of the document and by directly illuminating the light reflected by the document onto a photosensitive drum, the image reading apparatus relating to the present invention may be provided only for the purpose of determining the size of the document.

CLAIMS:

1. An image reading apparatus having a plate-shaped transparent member for receiving a document to be optically scanned by a photoelectric transducer having a plurality of photoelectric transducing elements such that the image recorded on the document is read, comprising:

a scanning device movable in a direction orthogonal to said photoelectric transducer, said scanning device irradiating light from a lamp and reflected by reflecting mirrors, to said photoelectric transducer;

a size detector for determining the size of a document disposed on said transparent member, on the basis of pixel signals outputted from the photoelectric transducing elements within a plurality of small regions that extend across specific edges of each of a plurality of documents of different sizes, the photoelectric transducing elements being disposed at substantially fixed positions on said transparent member, wherein said fixed positions of said small regions are changeable; and

a control portion connected to said scanning device and said size detector so as to control said scanning device.

2. An image reading apparatus having a plate-shaped transparent member for receiving a document to be optically scanned by a photoelectric transducer having a plurality of photoelectric transducing elements such that the image recorded on the document is read, comprising:

a scanning device movable in a direction orthogonal to said photoelectric transducer, said scanning device irradiating light from a lamp and reflected by reflecting mirrors, to said photoelectric transducer;

a size detector for determining the size of a document disposed on said transparent member, on the basis of pixel signals outputted from the photoelectric transducing elements within a plurality of small regions that extend across specific edges of each of a plurality of documents of different sizes, the photoelectric transducing elements being disposed at substantially fixed positions on said transparent member,

wherein at least some of said plurality of small regions include a pair of smaller regions corresponding to a pair of areas spanning specific edges of said document of a predetermined size at a predetermined interval, and

the position of the edge of said document and the size of said document are determined on the basis of whether levels of signals outputted from the photoelectric transducing elements within said smaller regions are greater than or equal to a predetermined value; and

a control portion connected to said scanning device and said size detector so as to control said scanning device.

3. An image reading apparatus according to claim 2, wherein said size detector compares an average value of the data, which is periodically sampled and extracted from a plurality of pixel data within said small regions, to a predetermined threshold value within each small region, and based on the results of comparison, the size of said document is determined.

4. An image reading apparatus having a plate-shaped transparent member for receiving a document to be optically scanned by a photoelectric transducer having a plurality of photoelectric transducing elements such that the image recorded on the document is read, comprising:

a scanning device movable in a direction orthogonal to said photoelectric transducer, said scanning device irradiating light from a lamp and reflected by reflecting mirrors, to said photoelectric transducer;

a size detector for determining the size of a document disposed on said transparent member, on the basis of pixel signals outputted from the photoelectric transducing elements within a plurality of small regions that extend across specific edges of each of a plurality of documents of different sizes, the photoelectric transducing elements being disposed at substantially fixed positions on said transparent member,

wherein at least some of said plurality of small regions include smaller regions which correspond to the area continuously spanning specific edges of said document of a predetermined size, and

the position of the edge of said document and the size of said document are determined on the basis of the change in levels of signals outputted from the photoelectric transducing elements within said smaller regions; and

a control portion connected to said scanning device and said size detector so as to control said scanning device.

5. An image reading apparatus according to claim 4, wherein the change in the levels of signals outputted from the photoelectric transducing elements within said small regions is detected by continuously comparing pixels within said small regions.

6. An image reading apparatus having a plate-shaped transparent member for receiving a document to be optically scanned by a photoelectric transducer having a plurality of photoelectric transducing elements such that the image recorded on the document is read, comprising:

a scanning device movable in a direction orthogonal to said photoelectric transducer, said scanning device irradiating light from a lamp and reflected by reflecting mirrors, to said photoelectric transducer;

a size detector for determining the size of a document disposed on said transparent member, on the basis of pixel signals outputted from the photoelectric transducing elements within a plurality of small regions that extend across specific edges of each of a plurality of documents of different sizes, the photoelectric transducing elements being disposed at substantially fixed positions on said transparent member,

a control portion connected to said scanning device and said size detector so as to control said scanning device; and

a cover movable between a position at which said transparent member is shielded and a position at which said transparent member is exposed, wherein before and after said transparent member is shielded by said cover, the size of said document is determined on the basis of the signals outputted from the photoelectric transducing elements.

7. An image reading apparatus according to claim 6, wherein said control portion is further connected to an angle sensor, which contacts said cover as said cover moves in a direction in which said cover is closed angularly, and to a cover closing detection means, which is mounted to a longitudinal direction distal end portion of said cover and detects a state in which said cover is completely closed, and

due to the ON/OFF combinations of said angle sensor and said cover closing detection means, the existence of said document and the size of said document are determined.

8. An image reading apparatus in which a document, which is disposed on a plate-shaped transparent member, is optically scanned by a photoelectric transducer having a plurality of photoelectric transducing elements such that the image which is recorded onto said document is read, comprising:

a size detector which determines the size of said document which is disposed on said transparent member, on the basis of pixel signals outputted from the photoelectric transducing elements within a plurality of small regions which correspond to the area across each specific edge of a plurality of documents of

different sizes which are disposed at substantially fixed positions on said transparent member; and

detection means which detects the existence of said document at a predetermined position on said transparent member wherein when said document is disposed on said transparent member in a first direction, said document exists regardless of the size of said document, and when said document is disposed on said transparent member in a second direction which is different from said first position, said document does not exist regardless of the size of said document,

wherein on the basis of the signals outputted from the photoelectric transducing elements within said plurality of small regions and the results of detection of existence of said document effected by said detection means, the size and direction of said document disposed on said transparent member are determined.

9. An image reading apparatus according to claim 8, wherein said detection means is a optical sensor disposed beneath said transparent member.

10. An image reading apparatus according to claim 8, wherein the signals outputted from said detection means are compared to a predetermined threshold value, and on the basis of the results of

comparison, the existence of the document is examined.

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L4: Entry 79 of 172 File: USPT Oct 10, 1995

DOCUMENT-IDENTIFIER: US 5456175 A
TITLE: Printing sheet making and printing apparatus

Abstract Text (1):
In a printing sheet making and printing system applicable to for example an electronic gravure printing system a printing sheet is sheathed in a printing sheet jacket to prevent the adhesion of dust and the occurrence of scratching on its surface and the feeding and ejection of the printing sheet to and from the cylinders of a printing sheet making machine and a printing machine is completely automated so that an operator can run the system without ever directly touching the printing sheet. A printing sheet, a printing sheet jacket, and devices for pulling the jacket and the printing sheet into a printing sheet making machine or a printing machine and removing the printing sheet from the jacket and winding and clamping it onto a cylinder for engraving of the printing sheet or printing with it and returning it to the jacket and ejecting the jacket and the printing sheet inside it from the machine after the engraving or printing all in a completely automated fashion are disclosed. The interchangeability of the printing sheets with respect to the cylinders is extremely good and consequently when image data such as a photograph is engraved color by color on a plurality of printing sheets and multicolor overprinting is carried out color non-alignment, color blurring, image distortion and scumming and the like do not readily occur and high image quality, fine printing can be performed. The invention facilitates development toward a completely automated electronic gravure printing system which can be run unmanned.

Application Filing Date (1):
19940822

Detailed Description Text (7):
This printing sheet jacket 6 can be simply manufactured by horizontally superposing a substantially rectangular base sheet 8 and cover sheet 9 of thickness approximately 200 microns made of a thermoplastic resin such as polyethylene resin or the like or PET resin sheet having its surface coated with about 5 to 40 .mu.m of a readily thermally decomposing material (for example a nitrocellulose compound) and thermally sealing three of the sides 6a, 6b and 6c in a substantial C-shape of a predetermined width (thermally fusing together the base sheet 8 and the cover sheet 9 by heating them while pressing them together).

Detailed Description Text (20):
A bar code label 23 for identifying the type of the printing sheet 1 sheathed inside the printing sheet jacket 6 (identifying its type in terms of whether or not it is a new printing sheet and what image data 2 is engraved on it in what colors, etc) is affixed to the upper side of the cover sheet 9 of the printing sheet jacket 6. As necessary, an observation hole 24 for identifying the above-mentioned type of the printing sheet 1 visually is provided in the cover sheet 9 of the printing sheet jacket 6.

Detailed Description Text (29):
For this, digital information representing an image such as a photograph is taken from a multimedia source such as a photograph scanner or a digital VTR and

electronically edited in an image processing computer or the like, and digital information for each of four colors such as cyan, magenta, yellow and black is obtained. The 1 to 4 printing sheets 1 are then put through the printing sheet making machine one after another and based on this color by color four-color digital information color by color image data 2 for each of the four colors is then separately engraved on the 1 to 4 printing sheets 1.

Detailed Description Text (200):
Because the levering action of this printing movement of the printing sheet clamper 258 in the direction of the arrow c.sub.5 and the direction of the arrow c.sub.5 ' enables the printing sheet clamper 258 to readily separate from the magnet 260, unclamping of the printing sheet clamper 258 can be effected easily.

Detailed Description Text (216):
Because after the two rows of sprocket pins on the cylinder have entered the two rows of sprocket holes in the printing sheet and the printing sheet is thereby wound onto the periphery of the cylinder at least the trailing end of the wound printing sheet is clamped by a printing sheet clamper onto the periphery of the cylinder, slippage and wrinkling of the printing sheet wound on the cylinder do not readily occur. Consequently the interchangeability of the printing sheet with respect to the cylinder is good, and when image data such as a photograph is engraved color by color in colors such as cyan, magenta, yellow and black and multicolor overprinting is carried out, color non-alignment, color blurring, image distortion and scumming and the like do not readily occur and high image quality, fine gravure printing can be performed.

Detailed Description Text (219):
By forward rotation of the cylinder the two rows of sprocket pins at the ends of the periphery of the cylinder are made to enter the two rows of sprocket holes formed in the printing sheet inside the printing sheet jacket two by two and the printing sheet is thereby automatically pulled out of the printing sheet jacket and wound onto the periphery of the cylinder. During this printing sheet winding operation the two rows of sprocket holes are press fitted onto the two rows of sprocket pins as far as the base portions thereof; at this time, because the pitch in the circumferential direction of the cylinder and the span in the axial direction of the cylinder of the two rows of sprocket pins are made slightly greater than the engaging pitch and the engaging span of the two rows of sprocket holes with respect to the sprocket pins, positioning of the printing sheet on the cylinder can be performed with high accuracy so that no slippage or wrinkling of the printing sheet occurs whatsoever. As a result the interchangeability of the printing sheet with respect to the cylinder is extremely good, and when image data such as a photograph is engraved color by color in colors such as cyan, magenta, yellow and black and multicolor overprinting is carried out, color non-alignment, color blurring, image distortion and scumming and the like do not readily occur and high image quality, fine gravure printing can be performed.

Detailed Description Text (224):
When the printing sheet is automatically wound onto the periphery of the cylinder, because after the printing sheet is wound onto the periphery of the cylinder by the two rows of sprocket pins on the cylinder being sequentially inserted into the two rows of sprocket holes in the printing sheet at least the trailing end of the printing sheet is clamped by the printing sheet clamper, the printing sheet can be wound onto the cylinder while being positioned thereon with high accuracy, and slippage and wrinkling of the printing sheet does not occur. Consequently, the interchangeability of the printing sheet with respect to the cylinder is extremely good, and when image data such as a photograph is engraved color by color in colors such as cyan, magenta, yellow and black and multicolor overprinting is carried out, color non-alignment, color blurring, image distortion and scumming and the like do not readily occur and high image quality, fine gravure printing can be performed.

Detailed Description Text (237):
Because the printing sheet removal/insertion opening is provided with an opening/closing flap, the printing sheet will not readily accidentally fall out of the printing sheet jacket while the printing sheet jacket is being handled.

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L4: Entry 90 of 172 File: USPT Oct 26, 1993

DOCUMENT-IDENTIFIER: US 5257083 A
TITLE: Storage assembly for development stations in an electrostatographic reproduction apparatus

Application Filing Date (1):
19920827

Detailed Description Text (9):
The electrostatographic process stations, of reproduction apparatus 10, function in the following manner to produce copies having accent color. A corona charger 18, coupled to a D.C. or biased A.C. electrical potential source (not shown), applies a uniform electrostatic charge to web 12 as it moves past charger 18. The uniform charge, in successive adjacent image receiving areas of web 12, is altered as web 12 passes through zone E, to form a latent image charge pattern in such areas corresponding to images of the information to be copied. For example, the latent image charge pattern is formed by exposure of the image-receiving area of web 12 to reflected light images of a particular area of the document located on a transparent platen P that is to be developed in a particular color. Of course, formation of image charge patterns on web 12 may be alternately accomplished by other suitable methods such as by exposure to electronic (e.g. LED array or laser scanner) or electrostatic produced images.

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L4: Entry 93 of 172 File: USPT Mar 30, 1993

DOCUMENT-IDENTIFIER: US 5198853 A
TITLE: Document size detection apparatus

Abstract Text (1):
A document size detector for detecting a size of a document in use with a document scanner. The document size detector has an irradiator to irradiate the document with a light beam; a cover of the document; a receiver of the reflection light from the document and the cover; a converter to convert the reflection light to image signals; a detector to detect the shadow of the document on the cover in the image signals; and the determiner to determine the size of the document according to the detected shadow of the document.

Application Filing Date (1):
19911105

Brief Summary Text (5):
Heretofore, there have been proposed various methods for detecting document sizes. For example, there has been known a method wherein plural optical sensors are provided at the locations under the document table corresponding to document sizes, and thereby the document size can be detected by output from the optical sensor. Further, in another example, the reverse side of the platen cover is blackened or mirror-finished so that the reflected light from a document may be different from that from non-document area when the document is held by the platen cover, and thereby the document size is detected by variation in the amount of light accepted by an optical sensor when the document is scanned (for example, Japanese Patent Examined Publication No. 64-2263 and Japanese Patent Publication Open to Public Inspection (Kokai) No. 54-83438 (hereinafter referred to as Japanese Patent O. P. I. Publication)).

Brief Summary Text (6):
In the detection method mentioned above, however, the amount of reflected light from the document is reduced in the case of a transparent document used for an OHP (overhead projector) or a thin document, being affected by the black or mirror-finished- reverse side of the platen cover. Therefore, the document can not be recorded clearly, or the record is hard to read even if it can be made. Further, in the detection method mentioned above, black streaks appear on the upper and lower margins or margins at the left side and the right side of the recording paper when the document is not placed accurately at the predetermined position on the document table. Therefore, it is necessary to eliminate the black streaks, and for this purpose, it is necessary to adjust accurately the sheet feed timing for the recording sheet and to prepare the signal processing circuit that prevents the occurrence of black streaks. Furthermore, when the recording sheet used is larger than the document black or mirror-finished areas around the document are recorded on the recording sheet, which is a problem.

Brief Summary Text (7):
Further, there has been known another detection method wherein yellow stripes are drawn on the reverse side of the platen cover and the document size is detected by the difference of color between the yellow stripe and white document. This method

still has the same problems as in the foregoing when a transparent or thin document is used, and in the case of a full color image, the yellow stripes are regarded as information for recording and thereby are recorded, which is also a problem.

Brief Summary Text (10):
However, when a position of the shadow is detected by judging whether the variation ratio of image signals obtained through reading document information exceeds the predetermined threshold value there is a fear that the position of the shadow is detected incorrectly because the variation ratio of image signals will increase in the area surrounding the document when the platen cover is soiled.

Brief Summary Text (12):
Further, when a position of the shadow of the document is detected by judging whether the variation ratio of image signals obtained through reading document information exceeds the predetermined threshold value, many variation points where the variation ratio of image signals exceeds the predetermined threshold value exist not only in the side edge area of the document but also in the area inside the document including document information, and such variation points further exist even in the area surrounding the document when the platen cover is soiled. Therefore, in the method wherein a position of the shadow is detected by detecting the variation point which first exists after investigating from the starting position for scanning and the ending position for scanning, there is a fear that the document size can not be detected accurately because of possible impossibility of making a reliable judgment.

Brief Summary Text (15):
For the purpose of achieving the aforementioned first object, a calculation means for calculating the variation ratios of the image signals both in the main scanning direction and the auxiliary scanning direction for the document, a detection means for detecting the outermost variation points both in the main scanning direction and the auxiliary scanning direction for the document among positions of variation points where the variation ratio of the image signals calculated in the aforesaid calculation means exceeds the threshold value, and judgment means for judging the width and the length of the document from the positions of the variation points detected by the aforementioned detection means are provided in the invention, and thus the size of the document can be detected by the judged width and length of the document.

Brief Summary Text (16):
In the aforementioned structure, the variation ratios of the image signals both in the main scanning direction and the auxiliary scanning direction for a document are calculated, and when there are some positions of variation points where the calculated variation ratio exceeds the predetermined value, the outermost positions of variation points both in the main scanning direction and the auxiliary scanning direction are detected, and the width and the length of the document are judged by the aforementioned positions of the variation points, and thereby the document size is detected by the obtained data of the width and length.

Brief Summary Text (17):
For the purpose of achieving the aforementioned second object, a calculation means for calculating the variation ratios of the image signals both in the main scanning direction and the auxiliary scanning direction for the document, a detection means for detecting the outermost variation points both in the main scanning direction and the auxiliary scanning direction for the document among positions of variation points where the variation ratio of the image signals calculated in the aforesaid calculation means exceeds the threshold value, a threshold value variation means for setting variably the threshold value in the aforementioned detection means, and judgment means for judging the width and the length of the document from the positions of the variation points detected by the aforementioned detection means are provided in the invention, and thus the threshold value in the aforementioned

detection means is caused to be variable.

Brief Summary Text (19):
For the purpose of attaining the aforementioned third object, there are provided in the invention, with noticing that a shadow is cast on an almost constant position for a document with a stipulated size, a calculation means for calculating the variation ratios of the image signals in the main scanning direction and in the auxiliary scanning direction for the document, a memory means wherein a probability distribution function having the maximum value at the position corresponding to the side edge position of the document with a stipulated size is stored, a detection means for detecting the positions of the outermost variation points in the main scanning direction and the auxiliary scanning direction for the document among positions of variation points where the product of the variation ratio calculated by the aforementioned calculation means and the aforementioned probability distribution function exceeds the predetermined threshold value, and a judgment means for judging the width and the length of the document from the positions of the variation points detected by the aforementioned detection means.

Brief Summary Text (21):
For the purpose of achieving the aforementioned second object, the document size detection apparatus of the invention is provided with an integration means which integrates image signals in a time series obtained through reading the document information respectively in the main scanning direction and in the auxiliary scanning direction, a calculation means which calculates the variation ratio of the integrated image signals a detection means which detects the outermost positions of variation points respectively in the main scanning direction and in the auxiliary scanning direction for the document among variation points where the variation ratio of the integrated value of image signals calculated in the calculation means exceeds the predetermined threshold value, and a judgment means which judges the width and the length of the document from the positions of variation points detected by the detection means.

Brief Summary Text (22):
In place of constitution wherein image signals are integrated in both the main scanning direction and the auxiliary scanning direction and the variation ratio for the integrated image signals is calculated as described above, another constitution wherein the variation ratios for image signals in the main scanning direction and the auxiliary scanning direction are calculated first, then, the absolute values for the calculated variation ratios are calculated, and the calculated absolute values of the variation ratios are integrated in the main scanning direction and in the auxiliary scanning direction may also be applicable.

Brief Summary Text (23):
Owing to the aforementioned constitution wherein image signals are integrated both in the main scanning direction and in the auxiliary scanning direction, noise components caused by copy soil existing on the peripheral area of a document are eliminated and thereby it is possible to detect the document size based on the image data free from noise components.

Drawing Description Text (7):
FIG. 5 is a diagram for illustrating how to scan the document for detecting the document size,

Drawing Description Text (8):
FIGS. 6-A and 6-B are waveform diagrams for image signals obtained by scanning the document,

Drawing Description Text (20):
FIG. 18-A shows image signals obtained through a single scanning,

Detailed Description Text (3):
FIG. 1 is a schematic diagram of an example of the image recording apparatus of the invention. The exemplified image recording apparatus is of a type wherein document information is read by a photoelectrical converting element such as a CCD and processed to be digital signals for formation of an optical image.

Detailed Description Text (6):
Under the document table 1, there is provided optical scanning system 4 (shown with broken lines) composed of exposure lamp 4a for illuminating the document, mirrors 4b, 4c and 4d on which the reflected light from the document is reflected, and CCD 4f that receives and photoelectrically converts the reflected light. Among the structural elements for the optical scanning system 4, unit A composed of exposure lamp 4a and mirror 4b illuminates the surface of the document while traveling in parallel with the document table 1 at the speed of v. In this case, unit B composed of mirrors 4c and 4d moves in the direction identical to that of the unit A at the speed of 1/2 v.

Detailed Description Text (7):
Writing unit 5 enclosed and shown with broken lines consists of rotating polygonal mirror (called a polygon mirror) 5b that is driven by motor 5a to rotate at a high speed, f.theta. lens 5c, cylindrical lens 5d and mirror 5e, and a laser beam that is modulated by digital image signals outputted from CCD 4f and is outputted from an unillustrated laser source is deflected to an extent equivalent to one scanning repeatedly by the rotating polygonal mirror 5b, and then is reflected by mirror 5e, thus, an electrostatic latent image of the document information is formed on the surface of photoreceptor drum 6.

Detailed Description Text (10):
In the image recording apparatus having the structure mentioned above, when a document is placed on document table 1 for recording the document information, the leading edge of the document G is caused to touch document stopper plate 1a, then, the document is positioned to the stipulated location based on the size mark indicated on the document stopper plate 1a, and the document is held by the platen cover 2. When recording button P is pressed, the optical scanning system 4 starts moving so that document G may be illuminated by exposure lamp 4a. Since reflection mirror of the exposure lamp 4a is arranged as shown in FIG. 3-A so that irradiating light from the lamp 4a may face backward (toward right upper direction in the drawing), shadow K.sub.1 of the document is cast on the platen cover 2 at the trailing edge of the document G. FIG. 3-B shows the shadow K.sub.1 casted on the platen cover 2 on a top view basis. The shadow is cast not only at the trailing edge of the document G but also at both side edges at left and right of the document as shadows K.sub.2. If the reflection mirror of the exposure lamp 4a is arranged as shown with chain lines in FIG. 3-A, the shadow K.sub.1 is not cast on the platen cover 2.

Detailed Description Text (12):
In FIG. 4 of the drawings CCD 4f forms a part of the optical scanning system 4 as explained relating to FIG. 1, and image signals of the document information output from the CCD 4f are processed by analog signal processing circuit 20 consisting of capacitor 20a for cutting DC component, amplifier 20b and DC regeneration clamp circuit 20c, then, gain-adjusted by gain adjustment circuit 21 consisting of offset adjuster 21a and operation amplifier 21b, converted by high speed type A/D converter 22 into digital signals, and then shading-compensated by shading compensation circuit 23. After that, the digital signals are used for modulation of laser beam as digital image signals. The shading compensation circuit 23 is composed of memory 23a for storing image signals obtained by reading information of white standard plate 3 (see FIG. 1), D/A converter 23b for converting image signals read out from the memory 23a into analog signals and amplifier 23c. When white image information obtained from white standard plate 3 is converted by D/A converter 23b into analog signals a given standard voltage of A/D converter 22,

unevenness of illumination of lamp 4a and deterioration thereof as well as uneven sensitivity of a pixel of CCD 4f are compensated.

Detailed Description Text (13):
Timing generation circuit 24 generates clock signals .phi. and shutter signals S for switching scanning in the main scanning direction, while, CCD 4f outputs image signals with timing of clock signals .phi..

Detailed Description Text (14):
Counter 25 counts shutter signals SH and counter 26 counts clock signals .phi.. Comparator 27 outputs "H" signal equivalent to one pixel when counted value of counter 26 reaches the predetermined value (2500, in the present example, which is determined as the number of pixels at the center point when the recording sheet of A4 size, for example, is scanned in the main scanning direction as shown in FIG. 4).

Detailed Description Text (18):
When document G is placed on document table 1 as shown in FIG. 5 and when the document G is scanned, signals shown in FIG. 6-A are obtained as image signals for one line. When such image signals are subjected to differential calculation for obtaining the variation ratio of the signals, the results thereof are those shown in the lower portion in the same figure. As is clear from the figure, the variation ratio is greater at the side edges in the lateral direction of the document. Therefore, it is possible to obtain the width W of the document G by obtaining the positions J and K for the variation points.

Detailed Description Text (19):
Likewise, from image signals equivalent to plural lines obtained by scanning the full page of the document G, when image signals at the specific point (shown with broken line Q in FIG. 5) when viewed in the main scanning direction are collected in the auxiliary scanning direction, the results are those shown in FIG. 6-B. When these image signals are subjected to differential calculation and thereby the variation ratio of the signals is obtained, the results are those shown in the lower portion in the same figure. It is therefore possible to obtain the length of the document G by obtaining the position T for the variation point where the variation ratio exceeds the threshold value for the first time from the point of the trailing edge of the document.

Detailed Description Text (20):
In the explanation below, the document information is read with a resolution of 16 dots/mm, and when the document is placed on the document table 1 so that the leading edge of the document G may touch the document stopper plate 1a as shown in FIG. 5, the number of the pixel located at the leftmost position in the main scanning direction on the reading area of the document glass surface is determined to be "0" and the number of the rightmost pixel is determined to be "5000", and the number of the scanning line located at the tip position in the auxiliary scanning direction is determined to be 0 and the number of the scanning line located at the rearmost position on the reading area of the document glass surface is determined to be 7000. For the detection of the width of the document, on the other hand, image data obtained from the 15th scanning line is used, and for the detection of the length of the document, image signals at the position of the pixel number of "2500" are used.

Detailed Description Text (21):
Since the standard positions of units A and B of the optical scanning system 4 (home positions) are close to the document stopper plate 1a on the apparatus main body 100, when recording button P is pressed and exposure lamp 4a is lit, the reflected light from the white standard plate 3 is received by CCD 4f and image data output from A/D converter 22 are stored in memory 23a of shading compensation circuit 23 and used as shading compensation data in image reading operation.

Detailed Description Text (24):
When recording button Pis pressed and thereby the recording operation is started, exposure lamp 4a of the optical scanning system 4 is lit and units A and B start moving.

Detailed Description Text (25):
Since counter 25 counts shutter signal SH for switching the main scanning for the document G, whether the 15th scanning line made by the optical scanning system 4 is completed or not is judged from the counted value, and when it is completed, it is called for differential calculation (F-2) because the image data obtained from scanning of the line is stored in memory (A) 28. The variation ratio obtained after differential calculus is stored in memory (C) 33 (F-3). Then, the number of pixels is counted successively beginning with a pixel having the pixel number of "0" located at the scanning start location (F-4), and the variation ratios stored in memory (C) 33 are read successively from the pixel number of "0" (F-5). Then, the read variation ratio is examined to determine whether or not it is lower than the threshold value (F-6), and when it is not lower than the threshold value, the number of pixel a.sub.1 where the variation ratio first exceeds the threshold value is stored in register R.sub.1 built in CPU 35 as position data of the variation point (F-7).

Detailed Description Text (26):
After the foregoing, the number of pixels is counted successively from the pixel having the pixel number of "5000" that is located at the scanning end location (F-8), and the variation ratios stored in memory (C) 33 are read successively from the pixel number of "5000" (F-9). Then, the read variation ratio is examined whether it is not lower than the threshold value or not (F-10), and when it is not lower than the threshold value, the number of pixel a.sub.2 where the variation ratio first exceeds the threshold value is stored in register R.sub.2 built in CPU 35 as position data of the variation point (F-11).

Detailed Description Text (30):
In FIG. 4, counter 26 counts clock signals .phi. and when the counted value reaches 2500, namely, when the image information of the pixel having the pixel number of "2500" is read, "H" signal equivalent to one pixel is output from comparator 27. Therefore, the AND conditions for the GATE circuit 32 are satisfied, and image data are stored in memory (B) 30. The counter 26 is cleared for each shutter signal, thus, same operation is repeated for each line scanning and the image information of the pixel having the pixel number of "2500" among all scanning lines is stored in memory (B) 30 as pixel data.

Detailed Description Text (31):
In FIG. 8, image data stored in memory (B) 30 are read and subjected to differential calculation (P-1), and the variation ratio is once stored in memory (C) 33 (P-2). Then, the number of lines is counted from the last scanning line, namely the line having the scanning number of "7000" (P-3), and the variation ratios stored in memory (C) 33 are read and compared with the threshold value (P-4). When the comparison shows that the variation ratio exceeds the threshold value (P-5), the number of line b.sub.1 where the the variation ratio first exceeds the threshold value is stored in register R.sub.1 built in CPU 35 as position data of the variation point (P-6).

Detailed Description Text (32):
The number of scanning line b.sub.1 which represents position data and obtained in the above manner is used in the following expression for calculating the length L of the document G (P-7).

Detailed Description Text (38):
First, a size table stored in memory 34 is read (M-1), and the width (W) obtained

from calculation is judged whether it is B5 width or not (M-2). When the result of the judgment shows that it is B5 width, "B5 width" is set in register R.sub.5 in CPU 35 as width size S.sub.w (M-3). When it is not B5 width, as a result of judgment, it is then judged whether it is A4 width or not (M-4). If it is A4 width, "A4 width" is stored in R.sub.5 in CPU 35 as width size B.sub.w (M-5). After that, B5 length, A4 length, B4 and A3 are judged in the same way in succession, for setting coinciding one in register R.sub.4 in CPU 35, if any (M-6 - M-13).

Detailed Description Text (41):
Incidentally, platen cover 2 is contaminated with toners and others while it is being used. Therefore, when a document is scanned without noticing the soil, the variation ratio for the image signals obtained therefrom sometimes takes a greater value at the peripheral area of the document, resulting in the erroneous detection of the document size.

Detailed Description Text (48):
When the recording button P is pressed and recording movements are started, exposure lamp 4a of optical scanning system 4 is lit, and units A and B start moving.

Detailed Description Text (49):
Since counter 25 counts shutter, signal SH that switches main scanning for document G, judgment is made from the counted value whether the optical scanning system 4 has finished scanning the 15th line or not (F-1), when it has finished scanning, the image data obtained from scanning of the line and stored in memory (A) 28 are called for access and subjected to differential calculation (F-2). The variation ratios obtained after differential calculation are stored in memory (C) 33 (F-3).

Detailed Description Text (50):
A probability distribution function stored in memory 34 is read (F-4). The probability distribution function includes a distribution function having the maximum value at a side edge position in lateral direction of each of standard document sizes of B5, A4, B4 and A3 as shown in FIG. 14-A and a distribution function having the maximum value at the trailing edge of each of standard document sizes as shown in FIG. 14-B. After that, the read probability distribution function and the variation ratio stored in memory (C) 33 are integrated each other (F-5). As a result, if the document size being detected is B5, the integrated value shows a waveform having the peak value at the side edge position of the document with a B5 size as shown in FIG. 14-A. This integrated value is stored in the memory (C) 33 again (F-6). Then, the pixel numbers are counted from the position of start scanning, namely from the pixel with the pixel number of "0" successively (F-7), and the variation ratios stored in the memory (C) 33 are read in succession from the pixel number of "0" (F-8). Then, the read variation ratio is examined whether it is not lower than the threshold value or not (F-9), and when it is not lower than the threshold value, the pixel number a.sub.1 where the variation ratio first exceeds the threshold value is stored in register R.sub.1 built in CPU 35 as position data of the variation point (F-10).

Detailed Description Text (51):
Next, the pixel numbers are counted in succession from the scanning end location, namely from the pixel having the pixel number of "5000" (F-11), and the variation ratios stored in the memory (C) 33 are read in succession from the pixel number of "5000" (F-12). Then, the read variation ratio is examined whether it is not lower than the threshold value or not (F-13), and if it is not lower than the threshold value, the pixel number a.sub.2 where the variation ratio first exceeds the threshold value is stored in register R.sub.2 in CPU 35 as position data of the variation point (F-14).

Detailed Description Text (55):
In FIG. 4, counter 26 counts clock signals .phi. and when the counted value reaches

2500, namely, when the image information of the pixel having the pixel number of "2500" is read, "H" signal equivalent to one pixel is outputted from comparator 27. Therefore, the AND conditions for the AND circuit 32 are satisfied, and image data are stored in memory (B) 30. The counter 26 is cleared for each shutter signal, thus, same operation is repeated for each line scanning and the image information of the pixel having the pixel number of "2500" among all scanning lines is stored in memory (B) 30 as pixel data.

Detailed Description Text (56):
In FIG. 13, image data stored in memory (B) 30 are read and subjected to differential calculation (P-1), and the variation ratio is once stored in memory (C) 33 (P-2).

Detailed Description Text (57):
Then, the probability distribution function shown in FIG. 14-A and stored in memory 34 are read (P-3) and are integrated with the variation ratios stored in memory (C) 33 (P-4). Incidentally, the probability distribution function in FIG. 9 may also be a step function wherein the area for the standard document sizes is represented by "1" and other area is represented by "0", for obtaining the same effect, and aforementioned other area may also be represented by "0.5" in place of "0". As a result, if the document size which is being detected is B5, the integrated value shows a waveform shown in FIG. 14-B. This integrated value is stored in memory 33 again (P-5). Then, the number of lines is counted from the last scanning line, namely the line having the scanning number of "7000" (P-6), and the variation ratios stored in memory (C) 33 are read and compared with the threshold value (P-7). When the comparison shows that the variation ratio exceeds the threshold value (P-8), the number of line b.sub.1 where the the variation ratio first exceeds the threshold value is stored in register R.sub.1 built in CPU 35 as position data of the variation point (P-9).

Detailed Description Text (58):
The number of scanning line b.sub.1 which represents position data and obtained in the above manner is used in the following expression for calculating the length L of the document G (P-10).

Detailed Description Text (60):
Next, an example for attaining the aforementioned second object of the invention will be explained. In FIG. 15, CCD 4f forms a part of the optical scanning system 4 as explained relating to FIG. 1 and image signals of the document information output from the CCD 4f are processed by analog signal processing circuit 20 consisting of capacitor 20a for cutting DC component, amplifier 20b and DC regeneration clamp circuit 20c, then, gain-adjusted by gain adjustment circuit 21 consisting of offset adjuster 21a and operation amplifier 21b, converted by high speed type A/D converter 122 into digital signals, and then shading compensated by shading compensation circuit 123. After that, the digital signals are used for modulation of laser beam as digital image signals. The shading compensation circuit 123 stores image signals obtained by reading information of white standard plate 3 (see FIG. 1), converts them to analog signals, and and impresses them as standard voltage of A/D converter 122, thus, unevenness of illumination of lamp 4a and deterioration thereof as well as uneven sensitivity of a pixel of CCD 4f are compensated.

Detailed Description Text (61):
Image data of the document information outputted from the A/D converter 122 are stored in memory (A) 124a and in memory (B) 124b alternately for every one line of scanning. Timing signal generation circuit 125 generates clock signals .phi. for controlling those such as driving timing for CCD 4f, switching timing for A/D converter 122 and shading compensation circuit 123, and writing or reading timing for memory (A) 124a and memory (B) 124b, as well as shutter signals SH for switching one line of scanning. In the present example, the memory 124a is

subjected each time to resetting of address made by each odd-numbered shutter signals SH, and stores image data A/D-converted in succession according to clock signals .phi. from address "0". Namely, it functions so that it stores an odd-numbered line temporarily. The memory (B) 124b, on the other hand, is subjected each time to resetting of address made by each even-numbered shutter signals SH, and stores image data A/D-converted in succession according to clock signals .phi. from address "0". Namely, it functions so that it stores an even-numbered line temporarily. Image data equivalent to a few lines are integrated are stored in memory (C) 126. The control of address and clock of memory (A) 124a and memory (B) 124b are conducted through memory controller 140.

Detailed Description Text (63):
Adder 129, while it contains adder active signals AAS, adds up image data in one line by means of register 130. Data of the register 130 are stored in memory (D) 131 by CPU 1,2 for every shutter signal SH. Immediately after completion of the aforementioned operation, the register 130 is cleared by CPU. With adder active signals ASS generated in succession thereafter, the adder 129 adds up image data in the register 130 again, and CPU 132 stores them in the address next to the previous data in memory (D) 131 according to shutter signals, and clears the register 130. To be concrete, in the memory 131, data added in the main scanning direction, namely, the integrated data are placed in the sequence of address in the auxiliary scanning direction.

Detailed Description Text (66):
When document G placed on document table 1 as shown in FIG. 17 is scanned, signals shown in FIG. 18-A are obtained as image signals for one line. When such image signals are integrated for some lines (50 lines in the present example), signal component (so-called noise component) N for toner soil on peripheral areas of a document is much smaller than the signal component for shadows around the document and for information on the document to be negligible, thus, image data shown in FIG. 18-B are obtained. When such image signals are subjected to differential calculation and thereby the variation ratios of the signals are obtained, the portion of the shadow is surely detected, resulting in easy detection of the width of the document.

Detailed Description Text (69):
In the explanation below, the document information is to be read with resolution of 16 dots/mm. When a document is placed on document table 1 so that the leading edge of the document G may touch document stopper plate 1a as shown in FIG. 17, the pixel number of the leftmost position in the main scanning direction on the document glass surface reading area is designated as "0" and the that of the rightmost position is designated as "5000", while, the scanning line number of the front row in the auxiliary scanning direction is designated as "1" and that of the lowermost position on the document glass surface reading area is designated as "7000". Further, 50 scanning lines used for detecting the width W of the document are assumed to be from the 10th line to the 60th line.

Detailed Description Text (70):
Since the standard position (home position) of units A and B of optical scanning system 4 is close the document stopper plate 1a on the apparatus main body 100, when a recording button is pressed and exposure lamp 4a is lit, the reflected light from white standard plate 3 is received by CCD 4f, and image data outputted from A/D converter 122 are stored in memory 123a of shading compensation circuit 123 to be used as shading compensation data on the occasion of image reading operation.

Detailed Description Text (73):
First, memories (A), (B) (C) and (D) are cleared (F-1), and then counter C built in CPU 132 is cleared (F-2). Arrival of shutter signals SH is waited and when they arrive (F-3), the number of scanning cycles is stored by means of increment of counter C (F-4).

Detailed Description Text (74):
In scanning for one line, on the other hand, when the pixel number reaches "2500", adder active signals AAS are outputted, and therefore, adder 129 takes in image data and transfers them to register (T) 130 and it further transfers them to memory 131 based on the command of CPU 132. In this case, increment of address of memory (D) 131 is conducted and register (T) 130 is cleared. The aforementioned operation is repeated for each scanning in the scannable area (the number of scanning lines for the greatest scanning area is assumed to be, for example, 7000) (F-6), and data for the portion from the pixel number of "2500" to that of "2550" among image data obtained from the result of scanning for each line are integrated in memory (D) 131.

Detailed Description Text (75):
When the number of scanning is superposed and counter C reaches 10, namely, in the case of the 10th scanning (F-7, F-8), image data for one line stored in memory (B) 124b are transferred to memory (C) 126 (F-9), and in the 11th scanning, image data for one line stored in memory (A) 124a are transferred to memory (C) 126 and the image data are added to image data for the 10th line which are already stored (F-10). The operation for adding to memory (C) 126 is repeated up to the 60th scanning.

Detailed Description Text (76):
On the other hand, the operation for integrating to memory (D) 131 is repeated as long as adder active signal ASS is generated, namely, it is repeated within the greatest scanning area (corresponding to 7000 in terms of counted value of counter C) (F-6).

Detailed Description Text (77):
When scanning for the entire document glass surface reading area is completed, image data from the 10th line to the 60th line are integrated and stored in memory (C) 126, and image data for the portion from the pixel number of "2500" to that of "2550" for all lines from the first line to the 7000th line are integrated and stored in memory (D) 131.

Detailed Description Text (80):
Integrated values stored in memory (C) 126 are read (W-1), and are subjected to differential calculation (W-2). Variation ratios obtained from the differential calculation are stored in memory (E) 134 (W-3). Then, the pixel numbers are counted in succession from the scanning start location, namely, from the pixel having the pixel number of "0" (W-4), and the variation ratios stored in memory (E) 134 are read in succession from the pixel number of "0" (W-5). Then, the read variation ratio is examined whether it is not lower than the threshold value or not (W-6), and if it is not lower than the threshold value, the pixel number a.sub.1 where the variation ratio first exceeds the threshold value is stored in register R.sub.1 built in CPU 132 as position data of the variation point (W-7).

Detailed Description Text (81):
After that, the pixel numbers are counted successively from the scanning end location, namely from the pixel having the pixel number of "5000" (W-8), and the variation ratios stored in memory (E) 34 are read in succession from the pixel number of "5000" (W-9). Then, the read variation ratio is examined whether it is not lower than the threshold value or not (W-10), and if it is not lower than the threshold value, the pixel number a.sub.2 where the threshold value first exceeds the threshold value is stored in register R.sub.2 of CPU 132 as position data of the variation point (W-11).

Detailed Description Text (85):
The integrated values stored in memory (D) 131 are read (L-1), and they are subjected to differential calculation (L-2). The variation ratios obtained from the

differential calculation are stored in memory (E) 134 (L-3). Then, the numbers of lines are counted from the last scanning line, namely from the line having the scanning number of "7000" (L-4), and the variation ratios stored in memory (E) 134 are read and compared with the threshold value (L-5). After the comparison, when the variation ratio exceeds the threshold value (L-6), the number of line b.sub.1 where the variation value first exceeds the threshold value is stored in register R.sub.1 built in CPU 132 as the position data of the variation point (L-7).

Detailed Description Text (86):
The number of scanning line b.sub.1 representing the position data of the variation point thus obtained is used in the following expression for calculating the length of the document G.

Detailed Description Text (89):
In the example described previously, image signals are integrated in the main scanning direction first, and then in the auxiliary scanning direction, and after that, the variation ratios of the integrated image signals are calculated. In the present example, however, the variation ratios of the image signals both in the main scanning direction and the auxiliary scanning direction are calculated, then, absolute values of the variation ratios are calculated, and the calculated absolute values of the variation ratios are integrated both in the main scanning direction and the auxiliary scanning direction.

Detailed Description Text (91):
The present example is additionally provided with differential circuit 141 that calculates the variation ratio of image signals in the main scanning direction, absolute value generator circuit 142 that calculates the absolute value of the variation ratio calculated by the differential circuit 141, differential circuit 143 that calculates the variation ratio of image signals in the auxiliary scanning direction and absolute value generator circuit 144 that calculates the absolute value of the variation ratio calculated by the differential circuit 143.

Detailed Description Text (93):
The variation ratio (d.sub.2 -d.sub.1) thus obtained is converted to the positive signal through the absolute value generator circuit 142 and is stored in the register (T) 130. The same differential calculation are conducted for the pixel range from the pixel number of "2500" to that of "2550", and variation ratios thus obtained are added in the adder 129 to be stored in the register (T) 130. The added value, namely the integrated value of the variation ratios obtained for each scanning line is caused by the command of CPU 132 to be stored in memory (D) 131.

Detailed Description Text (94):
In the differential circuit 143, on the other hand, the variation ratio in the auxiliary scanning direction is obtained by calculating the difference between the current image data outputted from A/D converter 122 and the image data before one scanning read from memory (A) 124a or memory (B) 124b, and the variation ratios thus obtained are subjected to absolute value generation in absolute value generator circuit 144, and then are stored in memory (C) 126 as positive data. The same differential calculation is conducted for each pair of adjoining scanning lines in the range from the 10th scanning line to the 60th scanning line, and variation ratios thus obtained are integrated and stored in the memory (C) 126 so that they may correspond to relevant pixel numbers respectively.

Detailed Description Text (97):
The operations (W'-3 through W'-12) after reading (W'-1) the variation ratio data in the main scanning direction stored in the memory (C) 126 and transferring them to memory (E) 134 are the same as those shown in FIG. 20.

Detailed Description Text (99):
In this case again, the operations (L'-3 through L'-8) after reading (L'-1) the

variation ratio data in the auxiliary scanning direction stored in the memory (D) 131 and transferring (L'-2) them to the memory (E) 134 are the same as those shown in FIG. 21 explained referring thereto.

Detailed Description Text (100):
In the invention, as stated above, the document size can be detected by detecting positions both in the main scanning direction and the auxiliary scanning direction of the shadow of the document edge which is casted on a platen cover due to the thickness of the document when the document is irradiated. Therefore, it is possible to record document information only even when the document is a transparent document to be used for OHP or a thin document, In addition to that, even when recording on the recording sheet which is larger than the document, neither excessive colors and patterns nor black streaks are produced on the area surrounding the document information area, and signal processing circuits for eliminating such unnecessary shadows and streaks are not needed at all.

Detailed Description Text (103):
Furthermore, for detecting the document size by detecting the positions in the main scanning direction and in the auxiliary scanning direction of shadows of the document edges which are casted on a platen cover due to the thickness of the document when the document is irradiated, image signals in time series in each scanning direction are integrated, and the integrated values are differentiated, or the absolute values of the variation ratios of image signals are differentiated. Therefore, noise components due to contamination caused by copying on the peripheral area of the document are eliminated, and thereby the S/N ratio is improved, thus, the document size can surely be detected.

CLAIMS:

1. A document size detection apparatus for detecting a size of a document provided on document scanning apparatus, comprising:

irradiating means for irradiating said document with a light beam in a primary irradiating direction and in an auxiliary irradiating direction;

covering means for covering said document;

receiving means for receiving a reflection of said light beam reflected from said document and said covering means;

conversion means for converting said reflection to image signals;

detecting means for detecting in said image signals, a shadow cast by said document onto said covering means when the document was irradiated by said light beam of said irradiating means;

determining means for determining said size of said document from said detected shadow of said document;

said detecting means including calculating means for calculating a plurality of variation ratios of said image signals, each variation ratio being represented by the equation ##EQU1## where d.sub.1 represents an image signal value at a location d.sub.1, and d.sub.2 represents an image signal value at a location d.sub.2, and wherein the locations of d.sub.2 and d.sub.1 are a predetermined number of positions apart and wherein the location value of d.sub.2 -d.sub.1 in the denominator of said equation equals one;

ascertaining means for ascertaining a first location where at least one of said plurality of variation ratios exceeds a first predetermined value at an outermost side of said document in said primary irradiating direction, and for ascertaining a

second location where at least one of said plurality of variation ratios exceeds a second predetermined value at an outermost side of said document in said auxiliary irradiating direction;

changing means for changing said first predetermined value and said second predetermined value; and

wherein said determining means determines said size of said document based upon the ascertained first and second locations.

5. A document size detection apparatus for detecting a size of a document provided on document scanning apparatus, comprising:

irradiating means for irradiating said document with a light beam in a primary irradiating direction and in an auxiliary irradiating direction;

covering means for covering said document;

receiving means for receiving a reflection of said light beam reflected from said document and said covering means;

conversion means for converting said reflection to image signals;

detecting means for detecting in said image signals, a shadow cast by said document onto said covering means when the document was irradiated by said light beam of said irradiating means;

determining means for determining said size of said document from said detected shadow of said document;

said detecting means including calculating means for calculating a plurality of variation ratios of said image signals, each variation ratio being represented by the equation ##EQU2## where d.sub.1 represents an image signal value at a location d.sub.1, and d.sub.2 represents an image signal value at a location d.sub.2, and wherein the locations of d.sub.2 and d.sub.1 are a predetermined number of positions apart and wherein the location value of d.sub.2 -d.sub.1 in the denominator of said equation equals one;

storing means for storing a probability distribution function wherein a largest value of said probability distribution function corresponds to a side edge of said document;

means for multiplying at least two of said plurality of variation ratios by said probability distribution function so that a plurality of multiplied values are obtained; and

means for ascertaining a first location where at least one of said plurality of multiplied values exceeds a first predetermined value at an outermost side of said document in said primary irradiating direction, and for ascertaining a second location where at least one of said plurality of multiplied values exceeds a second predetermined value at an outermost side of said document in said auxiliary irradiating direction;

wherein said determining means determines said size of said document based upon the ascertained first and second locations.

8. A document size detection apparatus for detecting a size of a document provided on document scanning apparatus, comprising

irradiating means for irradiating said document with a light beam in a primary

irradiating direction and in an auxiliary irradiating direction;

covering means for covering said document;

receiving means for receiving a reflection of said light beam reflected from said document and said covering means;

conversion means for converting said reflection to image signals;

detecting means for detecting in said image signals, a shadow cast by said document onto said covering means when the document was irradiated by said light beam of said irradiating means;

determining means for determining said size of said document from said detected shadow of said document included in said image signals;

said detecting means including calculating means for calculating a plurality of variation ratios of said image signals, each variation ratio being represented by the equation ##EQU3## where d.sub.1 represents an image signal value at a location d.sub.1, and d.sub.2 represents an image signal value at a location d.sub.2, and wherein the locations of d.sub.2 and d.sub.1 are a predetermined number of positions apart and wherein the location value of d.sub.2 -d.sub.1 in the denominator of said equation equals one;

ascertaining means for ascertaining a first location where at least one of said plurality of variation ratios exceeds a first predetermined value at an outermost side of said document in said primary irradiating direction, and for ascertaining a second location where at least one of said plurality of variation ratios exceeds a second predetermined value at an outermost side of said document in said auxiliary irradiating direction;

integration means for integrating said image signals in said primary irradiating direction and in said auxiliary irradiating direction for providing a plurality of integrated image signals; and wherein

said calculating means calculates a plurality of variation ratios of said integrated image signals.

10. A document size detection apparatus for detecting a size of a document provided on document scanning apparatus, comprising:

irradiating means for irradiating said document with a light beam in a primary irradiating direction and in an auxiliary irradiating direction;

covering means for covering said document;

receiving means for receiving a reflection of said light beam reflected from said document and said covering means;

conversion means for converting said reflection to image signals;

detecting means for detecting in said image signal, a shadow cast by said document onto said covering means when the document was irradiated by said light beam of said irradiating means;

determining means for determining said size of said document from said detected shadow of said document included in said image signals;

said detecting means including calculating means for calculating a plurality of variation ratios of said image signals, each variation ratio being represented by

the equation ##EQU4## where d.sub.1 represents an image signal value at a location d.sub.1, and d.sub.2 represents an image signal value at a location d.sub.2, and wherein the locations of d.sub.2 and d.sub.1 are a predetermined number of positions apart, and wherein the location value of d.sub.2 -d.sub.1 in the denominator of said equation equals one;

ascertaining means for ascertaining a first location where at least one of said plurality of variation ratios exceeds a first predetermined value at an outermost side of said document in said primary irradiating direction, and for ascertaining a second location where at least one of said plurality of variation ratios exceeds a second predetermined value at an outermost side of said document in said auxiliary irradiating direction;

means for obtaining a plurality of absolute values of said plurality of variation ratios; means for integrating said absolute values in said primary irradiating direction and in said auxiliary irradiating direction so that a plurality of integrated absolute values are obtained; and

said ascertaining means ascertaining a first location where at least one of said plurality of integrated absolute values exceeds a first predetermined value at an outermost side of said document in said primary irradiating direction, and ascertaining a second location where at least one of said plurality of integrated absolute values exceeds a second predetermined value at an outermost side of said document in said auxiliary irradiating direction.

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L4: Entry 96 of 172 File: USPT Jul 14, 1992

DOCUMENT-IDENTIFIER: US 5130726 A
** See image for Certificate of Correction **
TITLE: Ink jet recording apparatus

Application Filing Date (1):
19900228

Detailed Description Text (5):
For the purpose of the recovery from the ink ejection trouble through the discharging openings 5 of the recording head 2, an ink absorbing cap movable by a cap motor 6 is used. The position of the cap 3 is detected by a cap sensor 10. The platen 4 has a surface which is black in color, and is rotationally driven by a line feed motor 7 comprising a stepping motor to feed the recording medium 15. The presence or absence of the recording medium is detected by a mechanical type paper sensor 9. Simultaneously with the discrimination between the presence and absence of the recording medium, the discrimination may be made as to whether the recording medium is plain paper or OHP paper, with the structure which will be described hereinafter.

Detailed Description Text (98):
It refers to the digital input from the encoder sensor 13 and the home position sensor 11, and drives the carriage motor 308 through the DC servo reversing circuit 22 to control the movement of the recording head 2 in the main scanning direction.

Detailed Description Text (101):
For the purpose of this control, the CPU 20 has a read only memory containing a table determining, for all temperatures and for all recording densities, the magnitude of the applied energy when the pressure chamber 330 (FIG. 28) is expanded, more particularly, the level and time period of the applied pulse and the level and the time period of the applied pulse when the pressure chamber 330 is contracted.

Detailed Description Text (104):
Then, the carriage motor 8 reciprocates the recording head 2 in the main scan direction at a controlled constant speed. In synchronism with the reciprocating movement, the line feed motor 7 is driven to feed the recording paper one line by one line. During this, the head driver 24 supplies the signals corresponding to the record data 4 to the recording head 2, and the ink droplet is ejected from the nozzle 5 of the recording head to record characters and images.

Detailed Description Text (107):
Next, the temperature data of the ink liquid is received from the temperature sensor in the sensor group 25 at step S32. Subsequently, the CPU 20 selects an address corresponding to the image density level and the temperature datum for each of the picture elements of the record data in the internal ROM, and reads from the internal ROM the data of the energy to be applied upon the expansion of the pressure chamber 330 and the data of the energy to be applied upon contraction of the pressure chamber 330, at step S33. Then, the data are transmitted to the head driver 324 in synchronism with the dot recording.

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L4: Entry 105 of 172 File: USPT May 14, 1991

DOCUMENT-IDENTIFIER: US 5016049 A
TITLE: Document detecting device for an image forming apparatus

Application Filing Date (1):
19890602

Brief Summary Text (3):
This invention relates to an image handling device, wherein an image of a document placed on a glass document table is optically read and is projected onto a device for electrically retaining the image, especially to a device for detecting such document conditions as size and density of the image. (Density means darkness of the color hereinafter.)

Brief Summary Text (5):
In order to read a document image in an image forming apparatus as an example of such an image handling device, the document size and the density of the image ought to be detected for the purpose of determining the scanning area and the quantity of light. The followings are some examples of conventional methods for detecting the document size.

Brief Summary Text (6):
(1) Pre-scanning is conducted by a CCD for reading a document image. This method has the problems that pre-scanning prolongs the whole copying operation and that the document size cannot be detected unless the rear surface of a document holding cover has a different color from that of the document.

Brief Summary Text (7):
(2) A special sensor for detecting the document size is provided below a glass document table. One construction of this method is as follows. A sensor supporting arm, comprising two rods connected to each other with a pin, is equipped with a plurality of sensors and is connected to a scanner at one end thereof. The document size is detected by pivoting the two rods. Practically, when the scanner stops at the scan completing position, the sensor supporting arm is pivoted into a V shape. The on/off state of each sensor indicates whether there is a document in its detecting spot or not, and the detection results of all the sensors are computed, whereby the document size is found. When the scanner starts scanning and reaches its destination, the sensor supporting arm is folded into two along one end of the glass document table in its longitudinal direction. Although this method does not require pre-scanning and so shortens the whole copying operation, it involves the following problems. The connecting section of the sensor supporting arm and the scanner is inevitably complicated and also have to be highly accurate. Therefore, a lot of parts are required, which increases the size of the device, the production cost, and difficulty in processing, assembling and operation. Further, the load of a motor for driving the scanner is increased.

Brief Summary Text (9):
Accordingly, this invention has an object of offering an image handling device which conducts the detection of the document size and the density of the image in a short period of time without pre-scanning.

Brief Summary Text (13):
Still another object of this invention is to offer an image handling device which does the detection accurately even if a document has the same color with that of the rear surface of a document holding cover.

Brief Summary Text (16):
The above objects are fulfilled by an image handling device comprising a glass document table on which a document is to be placed; projecting means for optically scanning the document on the document table from below and for projecting a light corresponding to an image of the document onto a device for electrically retaining the image; at least one sensor for detecting document condition; sensor supporting means, for supporting the sensor, which is pivotal between a predetermined position below the glass document table and its original position outside the area right below the glass document table; and pivoting means for pivoting the sensor supporting means.

Brief Summary Text (23):
The pivoting center may be on the same side with the scan starting position of the projecting means, in view of the scanning direction.

Brief Summary Text (24):
The pivoting center may be on the same side with a side of the glass document table along which the document is aligned, in the view of the scanning direction.

Brief Summary Text (26):
According to the above construction, when the sensor supporting means is pivoted to the predetermined position below the glass document table, the sensor for detecting document condition is turned on or off in accordance with whether there is a document in its detecting spot or not, whereby the document size is detected. Therefore, there is no need of pre-scanning, and so the whole copying operation is done in a short period of time.

Brief Summary Text (27):
The above objects are also fulfilled by an image handling device comprising a glass document table on which a document is to be placed; a document holding cover pivotally provided so that it may be closed to cover the glass document table and opened; projecting means for optically scanning the document on the document table from below and for projecting a light corresponding to an image of the document onto a device for electrically retaining the image; at least one sensor for detecting document condition; sensor supporting means, for supporting the sensor, which is pivotal between a predetermined position below the glass document table and its original position outside the area right below the glass document table; pivoting means for pivoting the sensor supporting means; and control means for retracting the sensor supporting means back to its original position when the document holding cover is closed and for pivoting the sensor supporting means to the predetermined position when the document holding cover is opened.

Brief Summary Text (28):
According to this construction, the document holding cover is opened when the detection is executed. Therefore, even if the rear surface of the document holding cover has the same color with that of a document, the sensor does not misinterpret the rear surface as the document, resulting in the accurate detection.

Brief Summary Text (29):
The above objects are also fulfilled by an image handling device comprising a glass document table on which a document is to be placed; a document holding cover pivotally provided so that it may be closed to cover the glass document table and opened; angle detecting means for detecting whether the document holding cover is opened less than the predetermined angle or not; projecting means for optically

scanning the document on the document table from below and for projecting a light corresponding to an image of the document onto a device for electrically retaining the image; at least one sensor for detecting document condition; sensor supporting means, for supporting the sensor, which is pivotal between a predetermined position below the glass document table and its original position outside the area right below the glass document table; pivoting means for pivoting the sensor supporting means; computing means for driving the pivoting means to pivot the sensor supporting means up to the predetermined position and for detecting the size of the document using an output from the sensor; and commanding means for commanding the computing means to detect the document size when the angle detecting means detects that the document holding cover is opened not less than the predetermined angle.

Brief Summary Text (33):
The above objects are also fulfilled by an image handling device comprising a glass document table on which a document is to be placed; projecting means for optically scanning the document on the document table from below and for projecting a light corresponding to an image of the document onto a device for electrically retaining the image; a plurality of sensors for detecting document condition; sensor supporting means, for supporting the sensors, which is pivotal between a predetermined position below the glass document table and its original position outside the area right below the glass document table; pivoting means for pivoting the sensor supporting means; computing means for driving the pivoting means to pivot the sensor supporting means up to the predetermined position and for detecting the size of the document using the combination of outputs from the sensors; and judging means for selecting one out of combinations of outputs from the sensors, the above combinations not being used for document size detection, and for judging whether the sensor supporting means is at its original position or not using the above-selected combination.

Brief Summary Text (37):
The above objects are also fulfilled by an image handling device comprising a glass document table on which a document is to be placed; projecting means for optically scanning the document on the document table from below and for projecting a light corresponding to an image of the document onto a device for electrically retaining the image; at least one sensor for detecting document condition; sensor supporting means, for supporting the sensor, which is pivotal between a predetermined position below the glass document table and its original position outside the area right below the glass document table; pivoting means for pivoting the sensor supporting means; automatic mode setting means for pivoting the sensor supporting means up to the predetermined position to set the automatic mode, in which the size of the document is automatically detected by the sensor; manual mode setting means for setting manual mode, in which the size of the document is manually selected; and mode switching means for changing the automatic mode into the manual mode when the sensor supporting means is detected not to have been pivoted to the predetermined position.

Detailed Description Text (4):
The optical system 10 is provided below a glass document table 16 so that it may scan a document. The optical system 10 comprises an exposure lamp 17, movable mirrors 11, 12 and 13, a lens 14 and another mirror 15. The exposure lamp 17 and the movable mirror 11 are driven by a scanning motor M3 to integrally move in the direction of an arrow b at the speed of v/m (v: the circumferential speed of the photoconductive drum 1, fixed irrespective of the magnification ratio; m: magnification ratio). The movable mirrors 12 and 13 are also driven by the scanning motor M3 to integrally move in the direction of the arrow b at the speed of v/2 m. The magnification ratio is changed by the following theoretically known method. The lens 14 is moved on the optical axis by a stepping motor M4, and at the same time the mirror 15 is moved and swung in order to compensate the optical path. The scanning speed of the optical system 10 is adjusted by changing the rotating speed of the scanning motor M3 in accordance with the signal indicating the magnification

ratio. The practical description of the adjustment method will be omitted.

Detailed Description Text (6):
In more detail, when the automatic feeding means 20 is selected, the copier 100 operates as follows. A print key 82 (FIG. 10) is pushed for starting a copying operation of the copier 100, whereby predriving including the rotation of the photoconductive drum 1 starts. When it is finished, one of feeding rollers 25 and 26 is driven. Then, a scan starting signal is output, accompanied by the transport of the copying paper, whereby the optical system 10 is driven. In consequence, the copying paper is fed in synchronization with the image forming operation. Even if two or more sheets of copying paper are pushed in by the feeding roller 25 or 26, selveging means 27 or 27' feeds only the uppermost sheet.

Detailed Description Text (10):
An automatic document feeder ADF 200, which is loaded on the copier 100, will be described hereinafter. The ADF 200 substantially comprises a document feeding section 201 for storing multiple documents and sending them off one by one, and a document transport section 202 for transporting a document on the glass document table 16 by a transport belt 105, stopping the document at a predetermined position on the glass document table 16, and delivering the document onto a tray 204 after scanning. The document transport section 202 can also be used independently for manual feeding. The document transport section 202 has a document holding cover 205. Manual copying can be done by opening the cover 205 a predetermined angle and placing a document on the glass document table 16. Whether the cover 205 is opened or closed is detected by a switch KSW, which is schematically shown in FIG. 2.

Detailed Description Text (53):
FIG. 11 shows the main routine of the copying operation controlled by the above controlling circuit. When the copier 100 is initialized, an internal timer is set (S1). The internal timer controls the routine of copying operation round by round, and the operation of each step is measured based on this internal timer. When the internal timer is set, key-input signals from the operation panel 75 are read if there are some (S2), the size of a document on the glass document table 16 is detected (S3), abnormality is detected (S4), a duplication operation is executed (S5), and the other operations such as error display is executed (S6). When the period of time set in the internal timer passes (S7), the operations of S2 through S6 are repeated.

Detailed Description Text (65):
When the counter indicates 1 in S301, whether pre-scanning is finished or not is judged (S311), and if so, the counter is set 2 (S312). If not, the program goes to the main routine without changing the value of the counter and repeats the operation of state 1 until pre-scanning is finished. Thereafter, the counter is set 2 (S312). Pre-scanning is done when the power is turned off or when the copier 100 is restored from such a trouble as jamming, for the purpose of confirming the optical system 10 is normal.

Detailed Description Text (73):
When the counter indicates 4 in S301, whether the arm opening flag is 1 or not is judged (S341). If so, the outputs from the sensors 46 through 49 are read, in accordance with which the document size is detected in order to update the document size data stored in the memory 71 (S342).

Detailed Description Text (74):
FIG. 15 details the routine of updating the document size data. Whether the switch KSW is turned off or not (whether the cover 205 is opened less than 30.degree. or not) is judged (S3421). If the cover 205 is opened 30.degree. or more, the outputs from the sensors 46 through 49 are read, the document size is detected based on the combination of these outputs, and the document size data is updated (S3422). If the cover 205 is opened less than 30.degree., the program directly goes to the main

routine.

CLAIMS:

1. A document detecting device for an image forming apparatus comprising:

a glass document table on which a document is to be placed,

projecting means for optically scanning the document on said document table from below and for projecting a light corresponding to an image of the document onto a device for electrically retaining the image,

a plurality of sensors for detecting document condition,

sensor supporting means, for supporting said sensors, which is pivotal between a predetermined position below said glass document table and its original position outside the area right below said glass document table, and

pivoting means for pivoting said sensor supporting means, and

computing means for driving said pivoting means to pivot said sensor supporting means to the predetermined position and for detecting the size of the document dependent upon outputs from said sensors.

8. A document detecting device for an image forming apparatus claimed in claim 7, wherein the pivoting center is on the same side with the scan starting position of said projecting means, in view of the scanning direction.

9. A document detecting device for an image forming apparatus claimed in claim 7, wherein the pivoting center is on the same side with a side of said glass document table along which the document is aligned, in the view of the scanning direction.

11. A document detecting device for an image forming apparatus comprising:

a glass document table on which a document is to be placed,

a document holding cover pivotally provided so that it may be closed to cover said glass document table and opened,

projecting means for optically scanning the document on said document table from below and for projecting a light corresponding to an image of the document onto a device for electrically retaining the image,

a plurality of sensors for detecting document condition,

sensor supporting means, for supporting said sensors, which is pivotal between a predetermined position below said glass document table and its original position outside the area right below said glass document table,

pivoting means for pivoting said sensor supporting means,

computing means for driving said pivoting means to pivot said sensor supporting means to the predetermined position and for detecting the size of the document dependent upon outputs from said sensors, and

control means for retracting said sensor supporting means back to its original position when said document holding cover is closed and for pivoting said sensor supporting means to the predetermined position when said document holding cover is opened.

12. A document detecting device for an image forming apparatus comprising:

a glass document table on which a document is to be placed,

a document holding cover pivotally provided so that it may be closed to cover said glass document table and opened,

angle detecting means for detecting whether said document holding cover is opened less than the predetermined angle or not,

projecting means for optically scanning the document on said document table from below and for projecting a light corresponding to an image of the document onto a device for electrically retaining the image,

a plurality of sensors for detecting document condition,

sensor supporting means, for supporting said sensors, which is pivotal between a predetermined position below said glass document table and its original position outside the area right below said glass document table,

pivoting means for pivoting said sensor supporting means,

computing means for driving said pivoting means to pivot said sensor supporting means up to the predetermined position and for detecting the size of the document using an output from said sensors, and

commanding means for commanding said computing means to detect the document size when said angle detecting means detects that said document holding cover is opened not less than the predetermined angle.

15. A document detecting device for an image forming apparatus comprising:

a glass document table on which a document is to be placed,

projecting means for optically scanning the document on said document table from below and for projecting a light corresponding to an image of the document onto a device for electrically retaining the image,

a plurality of sensors for detecting document condition,

sensor supporting means, for supporting said sensors, which is pivotal between a predetermined position below said glass document table and its original position outside the area right below said glass document table,

pivoting means for pivoting said sensor supporting means,

computing means for driving said pivoting means to pivot said sensor supporting means up to the predetermined position and for detecting the size of the document using the combination of outputs from said sensors, and

judging means for selecting one out of combinations of outputs from said sensors, the above combinations not being used for document size detection, and for judging whether said sensor supporting means is at its original position or not using the above-selected combination.

18. A document detecting device for an image forming apparatus comprising:

a glass document table on which a document is to be placed,

projecting means for optically scanning the document on said document table from

below and for projecting a light corresponding to an image of the document onto a device for electrically retaining the image,

a plurality of sensors for detecting document condition,

sensor supporting means, for supporting said sensors, which is pivotal between a predetermined position below said glass document table and its original position outside the area right below said glass document table,

pivoting means for pivoting said sensor supporting means,

automatic mode setting means for pivoting said sensor supporting means up to the predetermined position to set the automatic mode, in which the size of the document is automatically detected by said sensor,

manual mode setting means for setting manual mode, in which the size of the document is manually selected, and

mode switching means for changing the automatic mode into the manual mode when said sensor supporting means is detected not to have been pivoted to the predetermined position.

21. A document detecting device for an image forming apparatus comprising:

a glass document table on which a document is to be placed,

projecting means for optically scanning the document on said document table from below and for projecting a light corresponding to an image of the document onto an image forming device,

a plurality of sensors for detecting document condition,

sensor supporting means, for supporting said sensors, which is pivotal between a predetermined position below said glass document table and its original position outside the area right below said glass document table,

pivoting means for pivoting said sensor supporting means,

automatic mode setting means for pivoting said sensor supporting means up to the predetermined position to set an automatic mode, in which the size of the document is automatically detected by said sensors,

manual mode setting means for setting manual mode, in which the size of the document is manually selected,

prohibiting means for prohibiting the image forming operation of the image forming device when said sensor supporting means is detected not to have been pivoted to the predetermined position in the automatic mode,

mode switching means for switching the automatic mode into the manual mode when said prohibiting means prohibits the above image forming operation, and

releasing means for releasing the prohibition of the above image forming operation when the automatic mode is switched into the manual mode.

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L4: Entry 110 of 172 File: USPT Oct 16, 1990

DOCUMENT-IDENTIFIER: US 4963934 A
TITLE: Image forming apparatus capable of shortening document size detection time

Abstract Text (1):
An image forming apparatus for forming an image on a flat image carrier having a size corresponding to a size of a document, includes a scanner for optically scanning the document to obtain an image of the document after the scanner has moved from a home position to a start position for scanning. A detector detects whether the document is at the home position. A processor determines the size of the document during the movement of the scanner away from the start position when the presence of the document is detected at the home position, and during the movement of the scanner toward the start position when the absence of the document is detected at the home position. The image of the document is formed on the image carrier in accordance with the size of the document determined by the processor.

Application Filing Date (1):
19890320

Brief Summary Text (5):
As a typical image forming apparatus, an electronic copying machine can be used. The electronic copying machine has a scanning unit for scanning a document. The scanning unit is provided with a carriage. During a copying operation, the scanning unit is moved by the carriage to a predetermined position (or a home position according to a magnification) in accordance with a paper size or a copying magnification. Normally, since the scanning unit is provided with an scale indicator, a distance from a scanning start position to the home position can be detected using the scale. This distance represents a copying range determined in correspondence with the size of a copy paper sheet on which a document image is to be formed. Then, the size of a placed document is detected in order to perform a copying operation according to a magnification. In this case, the scanning unit is moved from the home position (position indicating a copying range) to the scanning start position. Thereafter, an end portion of the document is detected while moving the scanning unit from the scanning start position in the scanning direction, thus determining a document size.

Brief Summary Text (6):
However, such document detection requires much time since the scanning unit is once returned to :he scanning start position and is then moved therefrom in the scanning direction.

Brief Summary Text (11):
It is still another object of the invention to provide an image forming system with means for measuring the size of paper to receive the image by scanning the image bearing document prior to transferring the image.

Brief Summary Text (13):
It is a further object of the invention to provide a method for operating an image forming apparatus in which the size of the document providing the image is measured by a scanning means and the proper sized image carrier selected to receive the

image.

Brief Summary Text (14):
It is another object of the invention to provide a method for creating an image on an image carrier by measuring the size of the document from which the image will be taken, this measurement being effected by the use of photodetectors to scan and calculate the document size on the basis of reflected signals from the document, selecting an image carrier size on the basis of the scanning information and operating the scanning means to place the image on the image carrier.

Brief Summary Text (15):
One object of the present invention can be achieved by an image forming apparatus for forming an image on a flat image carrier having a size corresponding to a size of a document, comprising means for optically scanning the document to obtain an image of the document after the scanning means has moved from a home position to a start position for scanning, means for detecting whether the document is at the home position, means for determining the size of the document during the movement of the scanning means away from the start position when the presence of the document is detected at the home position by the detecting means, and during the movement of the scanning means toward the start position when the absence of the document is detected at the home 20 position by the detecting means, and means for forming the image of the document on the image carrier in accordance with the size of the document determined by the determining means.

Detailed Description Text (3):
A first embodiment will be described first. FIG. 1 15 shows an outer appearance of an image forming apparatus of the present invention, e.g., an electronic copying machine. Document table (transparent glass) 2 on which a document (not shown) is placed is fixed on the upper surface of copying machine main body 1. Stationary scale 21 indicating a set reference position of a document is provided to document table 2. Openable/ closable document cover 11 and work table 12 are arranged near document table 2. As shown in FIG. 2, when a document is placed on document table 2, an optical system consisting of exposure lamp 4 and mirrors 5, 6, and 7 is reciprocated in directions indicated by arrows a1 and a2 along the lower surface of document table 2 so as to scan the document. In this case, mirrors 6 and 7 are moved at a speed 1/2 that of mirror 5 so as to maintain a predetermined optical path length. Light reflected by the scanned document, i.e., light reflected by the document upon light radiation of exposure lamp 4, is reflected by mirrors 5, 6, and 7, passes through magnification change lens block 8, and is then reflected by mirror 9. Thereafter, the light is guided to photosensitive drum 10, the surface of which is precharged by charger 11. A document image is formed on the surface of photosensitive drum 10, thus forming a so-called electrostatic latent image. Photosensitive drum 10 is normally rotated in a direction indicated by arrow c. The latent image is visualized by toner supplied from developing unit 12.

Detailed Description Text (12):
As shown in FIG. 4, first carriage 411 is moved to a home position according to a magnification (e.g., detection position X shown in FIG. 14) when motor 33 is driven in accordance with a paper size and a copying magnification. Upon scanning of a document, first carriage 411 is moved from the home position in a direction of second carriage 412 (a direction of arrow a2) as a direction of a scanning start position. Thereafter, exposure lamp 4 is turned on, and carriage 411 is moved from the scanning start position in a direction (direction of arrow a1) away from second carriage 412. In this manner, when scanning of the document is completed, exposure lamp 4 is turned off, and first carriage 411 is returned to the home position.

Detailed Description Text (13):
Prior to scanning a document, the document size is detected in advance. More specifically, document detector 63a (63b) consisting of photosensor 61 (161), light emitting diode 62 (162), and the like is provided to first carriage 411, as shown

in FIG. 6. In document detector 63a or 63b, light reflected by document (white document) G or document cover 11 upon light radiation from light-emitting diode 62 (162) is received by photosensor 61 (161) through document table 2, as shown in FIG. 6. Photosensor 61 (161) converts the reflection light into electrical signals according to reflectivity of document G or document cover 11.

Detailed Description Text (15):
Document detector 63b has the same circuit arrangement as document detector 63a. The operation of circuit 163 will be described below. As described above, light reflected by document (white document) G or document cover 11 upon light radiation from light-emitting diode 62 (162) is received by photosensor 61 (161) through document table 2. Photosensor 61 (161) then generates an electrical current according to the reflection light. The voltage difference caused by the flowing current between anode and cathode of photosensor 61 is amplified by operational amplifier IC1. This amplified voltage is compared with a reference voltage by comparator 68. The comparison result is supplied to a processor group (to be described later) through an interface (not shown) including a level adjuster. The presence/absence of document G is identified by the processor group, and its size is automatically determined. The detection operation of document detectors 63a and 63b will be described in detail below with reference to FIG. 9. Document detectors 63a and 63b of first carriage 411 are arranged to be movable (be able to scan) along straight lines A--A and B--B with respect to document table 2, respectively, as shown in FIG. 9. "A5"- to "A3"-size documents can be placed on document table 2, and any document is placed with reference to the center (indicated by an alternate long and short dashed line in FIG. 9) of document table 2.

Detailed Description Text (17):
A difference in reflectivity from document (white document) G or document cover 11 will be explained below referring to FIGS. 6 and 8. The rear surface portion of document cover 11 is colored in a color having high sensitivity with respect to photosensitive drug 10. For example, when drum 10 comprises a selenium-based photoconductor, the rear surface portion of document cover 11 is colored in light blue. This is because a blue image is difficult to be formed on drum 10 comprising a selenium-based photoconductor, that is, blue having high sensitivity with respect to selenium-based drum 10 is not almost exposed Therefore, when a fluorescent lamp is used as exposure lamp 4, light blue is processed like white, so that the color of document cover 11 does not influence a copied image.

Detailed Description Text (20):
Document detector 63a (63b) comprising light emitting diode 62 (162) for radiating red to orange light components to document G or document cover 11 colored in light blue and photosensor 61 (161) for receiving light reflected by document G or document cover 11 upon light radiation from diode 62 (162), supplies its output to main processor group 71 through amplifier 66 (166) for converting an output from photosensor 61 (161) into a voltage signal, and comparator 68 (168) for comparing the output received from sensor 61 (161) through amplifier 66 (166) with a reference voltage (Vref) for compensating for a variation in sensor sensitivity or a variation in output level of the sensor caused by a change in temperature. In a copying operation in the continuous page copying mode, a document size is detected based on outputs from document detectors 63a and 63b prior to document scanning. When the presence of the second page cannot be detected in accordance with the detected document size, i.e., when a single document which is not suitable for the continuous page copying operation is detected based on the document size, the continuous page copying mode is automatically canceled.

Detailed Description Text (21):
Motor 31 is a lens motor for moving the position of lens block 8 in a variable magnification mode, motor 32 is a mirror motor for changing a distance (optical path length) between mirror 5 and mirrors 6 and 7 in the variable magnification mode, motor 33 is a scanning motor for moving first carriage 411, motor 34 is a

shutter motor for moving a shutter (not shown) for adjusting a charging width by charger 11, motor 35 is a developing motor for driving developing rollers and the like of developing unit 12, motor 36 is a drum motor for driving photosensitive drum 10, motor 37 is a fixing motor for driving conveyor belt 22, fixing roller pair 23 and exhaust roller pair 24, motor 38 is a paper feed motor for driving pickup rollers 15 and 16, motor 39 is a paper feed motor for driving register roller pair 19, and motor 40 is a fan motor for driving cooling fan 29. Of motors 31 to 40 and 58, motors 35, 37, and 40, and toner motor 77 for supplying toner to developing unit 12 are controlled by main processor group 71 through motor driver 78, motors 31 to 34 are controlled by first subprocessor group 72 through pulse motor driver 79, and motors 36, 39, 38, and 58 are controlled by second subprocessor group 73 through pulse motor driver 80.

Detailed Description Text (22):
Stepping motor 33 is controlled by processor group 71 through stepping motor driver 72. In a discrimination operation for detecting a document size, the rotational direction of stepping motor 33 is controlled in accordance with the detection result of document G by document detectors 63a and 63b at the home position of first carriage 411. More specifically, when document G is detected at the position of first carriage 411 (e.g., detection position V shown in FIG. 13) when copy key 301 of operation panel 30 is operated, stepping motor 33 is rotated to move first carriage 411 from the detected position in a direction (a1 direction) opposite to the scanning start position, i.e., away from second carriage 412. When no document G is detected at the position of first carriage 411 (e.g., detection position X shown in FIG. 14) when copy key 301 of operation panel 30 is operated, stepping motor 33 is rotated to move first carriage 411 from the detected position toward second carriage 412, i.e., toward the scanning start position (a2 direction).

Detailed Description Text (25):
Note that main processor group 71 comprises a RAM (random access memory) storing position data for detecting the position (detection position) of first carriage 411 based on count data obtained by counting the number of pulses from first sub-processor group 72 to motor 33, and a ROM (read-only memory) storing identification data for detecting a document size in accordance with the output level of photosensor 61 (161) when first carriage 411 is located at each detection position obtained based on the position data.

Detailed Description Text (26):
Processor group 71 is connected to pulse counter 73 for counting the number of pulses supplied to stepping motor driver 72, and memory 74 storing various data subjected to size determination of a document. Memory 74 comprises a RAM (random access memory) storing position data (detection position) indicating the position of first carriage 411 in accordance with a pulse count, and a ROM (read-only memory) storing discrimination data for determining a document size in accordance with a combination of the position data and the output level of photosensor 61 (161).

Detailed Description Text (33):
A document detection operation will be described hereinafter with reference to the flow chart of FIGS. 15A and 15B. Assume that first carriage 411 is located at a home position according to a magnification (e.g., detection position X shown in FIG. 14) in accordance with an input predetermined paper size and magnification. In addition, document G is placed on document table 2, document cover 11 is closed, and copy key 301 of operation panel 30 is depressed. In this case, document detectors 63a and 63b are operated to check the presence/absence of document G at the home position of first carriage 411 (indication position of the copying range by scale 63). More specifically, upon depression of copy key 301 of operation panel 30, light-emitting diode 62 (162) is turned on (step 1), and reflection light from document G or document cover 11 is received by photosensor 61 (161). Reflection light from document G or document cover 11 is photoelectrically converted by

photosensor 61 (161), and the electrical signal is converted by amplifier 66 (166) to a voltage signal. The voltage signal is supplied to comparator 68 (168), and is compared with reference voltage Vref. The comparison result, i.e., the output from photosensor 6. (161) corrected based on the reference voltage is supplied to processor group 71. Processor group 71 checks the output levels of photosensors 61 and 161 of document detectors 63a and 63b so as to determine whether or not document G is located on a document table 2 portion corresponding to the home position of first carriage 411 (step 2). If it is determined in step 2 that document G is located on the document table 2 portion corresponding to the home position (this case is shown in FIG. 13), first carriage 411 is moved from the home position in a direction (direction of arrow a1 in FIG. 4) opposite to the scanning start position, i.e., away from second carriage 412 by stepping motor 33 controlled by processor group 71 through stepping motor driver 72 (step 3). In other words, when document G is detected (indicated by mark "o") at the position of first carriage 411 when copy key 301 is operated, it is determined that document G is larger than the copying range indicated by scale 53 on first carriage 411. Thus, first carriage 411 is moved from that position (home position) in a scanning direction away from second carriage 412. During movement of first carriage 411, it is checked if first carriage 411 has reached one of document detection positions T, U, V, W, X, Y, and Z (step 5). If YES in step 5, the presence/absence of document G is determined at that position (step 6). That is, reflection light components from document G at that position and document cover 11 are received by photosensor 61 (161). If NO in step 6, the output level is set to be mark "x" and step 7 is executed. If YES in step 6, the output level is set to be mark "o" and step 7 is executed. The reflection light components from document G and document cover 11 are photoelectrically converted by photosensor 61 (161), and the electrical signal is converted to a voltage signal by amplifier 66 (166). Thereafter, the voltage signal is compared with reference voltage Vref by comparator 68 (168). The output from photosensor 61 (161) corrected based on reference voltage Vref is supplied to processor group 71.

Detailed Description Text (35):
For example, as shown in FIG. 13, when "A3"-size document (indicated by a hatched portion) G is placed on document table 2 and first carriage 411 is moved to the home position (detection position V) of a range of a "longitudinal A4"-size document as a copying range, document G is detected (indicated by mark "o") by document detectors 63a and 63b First carriage 411 is then moved in a direction of arrow a1 in FIG. 13, and scanning for document size detection by document detectors 63a and 63b is performed. In this case, document G is detected (indicated by marks "o") by document detectors 63a and 63b when first carriage 411 is located at detection positions V to Z. Such a detection state is established (assuming that document G is also detected at detection positions T and U) only when document G has an "A3" size, as shown in FIG. 11. In this case, processor group 71 determines that document G has an "A3" size.

Detailed Description Text (36):
It is then checked if first carriage 411 has reached the trailing end (scanning end position) of document table 2 (step 7). Step 7 is also executed if it is determined in step 5 that first carriage 411 has reached the document detection position. If YES in step 7, first carriage 411 is moved toward second carriage 412 (direction of arrow a2) by stepping motor 33 controlled by processor 71 through stepping motor driver 72, and is stopped at the scanning start position. If NO in step 7, step 5 is repeated. After execution of step 7, light-emitting diode 62 (162) is turned off (step 8), and stepping motor 33 is also deenergized (step 9), thus completing document detection.

Detailed Description Text (37):
Meanwhile, if it is determined in step 2 that document G is not present on the document table 2 portion corresponding to the home position of first carriage 411 (this case is shown in FIG. 14), first carriage 411 is moved toward the scanning

start position (in a direction of arrow a2 in FIG. 4) by stepping motor 33 controlled by processor 71 through stepping motor driver 72. More specifically, when document G is not detected at the position of first carriage 411 when copy key 301 is operated, i.e., when document cover 11 is detected (indicated by mark "x"), it is determined that document G is smaller than the copying range indicated by scale 53 and the like on first carriage 411. First carriage 411 is then moved from that position toward second carriage 412, i.e., toward the scanning start position. Thereafter, steps similar to those executed when a document is detected at the home position are executed. During movement of first carriage 411, reflection light components from document G and document cover 11 upon turning-on of light-emitting diode 62 (162) are received by photosensor 61 (161). The reflection light components from document G and document cover 11 are photoelectrically converted by photosensor 61 (161), and the electrical signal is converted to a voltage signal by amplifier 66 (166). Thereafter, the voltage signal is compared with the reference voltage by comparator 68 (168). The output from photosensor 61 (161) corrected based on reference voltage Vref is supplied to processor group 71.

Detailed Description Text (39):
For example, as shown in FIG. 14, when "longitudinal A4"-size document (indicated by a hatched portion) G is placed on document table 2 and first carriage 411 is moved to the home position (detection position X) of a range of a "lateral A4"-size document as a copying range, document cover 11 is detected (indicated by marks "x") by document detectors 63a and 63b. First carriage 411 is moved in the direction of arrow a2 in FIG. 14, and scanning for document size detection by document detectors 63a and 63b is performed. In this case, when first carriage 411 is located at one of detection positions V to T, document G is detected (indicated by marks ("o") by document detectors 63a and 63b. Such a detection state is established (assuming that document G is also detected at detection positions W to Z) only when document G has a "longitudinal A4" size, as shown in FIG. 11. In this case, processor group 71 determines that document G has a "longitudinal A4 " size.

Detailed Description Text (40):
Note that first carriage 411 is stopped when it has reached the scanning start position.

Detailed Description Text (41):
In this manner, the presence/absence of document G 5 at the position of first carriage 411 when a copy start instruction is input (indication position of the copying range by scale 53) is detected, and the scanning direction (moving direction of first carriage 411) for document size detection is switched in accordance with the detection result. Thus, since movement for document size detection can be started from the current position of first carriage 411, time required for detection can be shortened.

Detailed Description Text (42):
When automatic detection of a document size is 15 completed, first carriage 411 is moved in a direction (direction of arrow al) away from second carriage 412 by stepping motor 33 controlled by processor group 71 through stepping motor driver 72. Exposure lamp 4 is turned on by processor group 71, and upon movement of first carriage 411 from the scanning start position to the scanning end position, image scanning of document G is started. In this case, regardless of a copying range indicated in correspondence with selected paper P, a paper size is automatically selected (in an equal magnification mode) in accordance with a detected document size, a paper size is automatically selected in accordance with a copy size determined based on a document size and a magnification, or a copying magnification is automatically set (in a variable-magnification copying mode) based on a document size and a paper size, thus allowing an efficient image forming operation.

Detailed Description Text (45):
If it is determined in step 2 that no document is present at the current position

(this case is shown in FIG. 14), stepping motor 33 is energized (step 8), and first carriage 411 begins to move in the direction of arrow a2 in FIG. 2. After steps 7 and 8, it is checked if first carriage 411 has reached any one of the document detection positions (step 9). If YES in step 9, the presence/absence of the document at that position is detected (step 10). If NO in step 10, the output level is set to be mark "x" and step 11 is executed. If YES in step 10, the output level is set to be mark "o" and it is checked if first carriage 411 has reached the scanning start or end position (step 11). Step 11 is also executed when a document cannot be detected at any detection position in step 9. If NO in step 11, step 9 is repeated. If YES in step 11, light-emitting diode 62 (162) is turned off (step 12), and stepping motor 33 is also deenergized (step 13). Thereafter, it is checked if an automatic magnification mode is selected (step 14). If NO in step 14, a cassette is selected (step 15), thus completing document detection. If YES in step 14, a magnification is determined (step 16). It is checked if first carriage 411 is located at the closest paper-feed side (step 17). If YES in step 17, stepping motor 33 is energized (step 18), and first carriage 411 begins to move in the direction of arrow a2 in FIG. 2. Furthermore, it is checked if first carriage 411 has reached a paper-exhaust position (step 19). If NO in step 19, step 19 is repeated. If YES in step 19, stepping motor 33 is deenergized (step 20), and lens motor 31 is energized (step 21). As a result, lens block 8 begins to move. Step 21 is also executed when first carriage 411 has not yet reached the paper-exhaust position. It is checked if lens block B has reached a target magnification position (step 22). If NO in step 22, step 22 is repeated. If YES in step 22, lens motor 31 is deenergized (step 23), and mirror motor 32 is energized (step 24). Thus, magnification change mirrors 5, 6, and 7 begin to move. It is then checked if mirrors 5, 6, and 7 have reached target positions (step 25). If NO in step step 25, step 25 is repeated. If YES in step 25, mirror motor 32 is deenergized (step 26), thus completing document detection. As described above, at the indication position of the image forming range of a document on the document table by an indication means provided to a scanning means, a detection means detects whether or not a document is present on the document table. Thus, the moving direction of the scanning means for document size detection is switched depending on whether the document is detected or not at the indication position. Therefore, document size detection can be started upon movement of the scanning means from the indication position of the image forming range by the indication means.

Detailed Description Text (46):
More specifically, the presence/absence of a document at the position of the first carriage when the copy key is operated is detected, and the scanning direction for document size detection is switched in accordance with the detection result. In this manner, in a copying machine in which a first carriage has a scale indicating a copying range, since the first carriage is located in the middle of a range to be scanned, scanning for document size detection can be started from this position. Therefore, the first carriage need not be returned to the scanning start position each time document size detection is performed, and time required for document size detection can be shortened.

Detailed Description Text (49):
The copying machine in which the photosensitive 10 drum comprises a selenium-based photoconductor has been exemplified. When a photosensitive drum is not of selenium-based type, the present invention can be readily applied by changing the color of the document cover and the color of light radiated from the light-emitting diode.

Detailed Description Text (50):
Upon a document size detection operation, a reference voltage can be read from a reference reflection unit, and a variation in output level of photosensors is corrected with constant reflectivity based on the reference voltage read from the reference reflection unit, so that an erroneous detection caused by a variation in sensor sensitivity or a change in temperature can be prevented.

Detailed Description Text (57):
When size detection of document G is performed, first carriage 411 is moved to the document scanning start position, and a copying operation is initiated by document scanning from that position. With the copying operation, images on the first and second pages are formed on paper sheets P selected in step 10 (step 11). In this manner, equal-magnification copies (copied images) including the first and second images corresponding to the first and second pages of "A3"-size document G which are copied on "A4"-size paper sheets P are continuously output, thus completing the operation.

Detailed Description Text (62):
When size detection of document G is performed, first carriage 411 is moved to the document scanning start position, and a copying operation is started from that position by document scanning. With the copying operation, images on the first and second pages are formed on paper sheets P selected in step 21 (step 22). In this manner, equal-magnification copies (copied images) including the first and second images corresponding to the first and second pages of "B4"-size document G which are copied on "B5"-size paper sheets P are continuously output, thus completing the operation.

Detailed Description Text (63):
However, if it is detected in step 20 that the size of document G is not a "B4" size, it is determined that document G is not suitable for the continuous page copying operation, and a normal copying operation is performed in the subsequent steps. More specifically, when document G has a size other than a "B4" size and the presence of a second document image cannot be detected, the selected continuous page copying mode is canceled (step 23). A normal copying operation is started by document scanning of first carriage 411 from the scanning start position (step 24). Thus, an image of document G is formed on paper sheet P corresponding to its size, and is output. In this manner, when the presence of a second page is not detected, the continuous page copying mode is canceled, and only an equal-magnification copy of the first page is output, thus completing the operation.

Detailed Description Text (69):
When size detection of document G is performed, first carriage 411 is moved to the document scanning start position, and a copying operation is started from that position by document scanning. With the copying operation, images on the first and second pages are formed on paper sheets P selected in step 36 (step 37). In this manner, equal-magnification copies (copied images) including the first and second images corresponding to the first and second pages of "B4"-size document G which are copied on "B5"-size paper sheets P are continuously output, thus completing the operation.

Detailed Description Text (70):
However, if it is detected in step 35 that the size of document G is not a "B4" size, it is determined that document G is not suitable for the continuous page copying operation, and a normal copying operation is performed in the subsequent steps. More specifically, when document G has a size other than a "B4" size and the presence of a second document image cannot be detected, the selected continuous page copying mode is canceled (step 38). A normal copying operation is started by document scanning of first carriage 411 from the scanning start position (step 39). Thus, an image of document G is formed on paper sheet P corresponding to its size, and is output. In this manner, when the presence of a second page is not detected, the continuous page copying mode is automatically canceled, and only an equal-magnification copy of the first page (document G) is output, thus completing the operation.

CLAIMS:

1. A document size detection system for an image forming apparatus, the system

comprising:

scanning means for scanning a document from a starting position at one end of the document to the other end;

document size detecting means located on, and movable with, the scanning means, for detecting the document size;

actuating means for moving the document size detecting means from a home position through a plurality of document size detecting positions to the scan starting position;

means for determining whether the document is present at the home position and, accordingly, controlling the direction of movement of the document size detecting means, the direction of movement initially being away form the starting position if the document is present at the home position and initially toward the starting position if it is not present; and

means for computing the size of the document from optical signals received by the detecting means.

2. The system of claim 1, wherein the home position is located at or near the middle point of the path traversed by the scanning means.

4. The system of claim 1, wherein the detecting means includes a plurality of detectors located on one side of the scanning means.

7. A document detecting system for an image forming apparatus, comprising:

means for positioning first and second documents on the apparatus;

means for scanning the first and second documents from a starting position at the end of the first document;

detecting means mounted on said scanning mans, for detecting the presence of the second document on the apparatus;

means for actuating the detecting means from a position other than the starting position; and

means for terminating operation of the scanning when the detecting means no longer detects the presence of the second document.

10. The system of claim 8, further including:

scanning means for scanning an image from the document; and

means for moving the scanning means from a starting position at one end of the document to its other end, to form the image on an image carrier.

13. The system of claim 8, wherein the detecting means are located on the scanning means.

14. The system of claim 12, in which the detecting means are located on one side of the scanning means.

15. The system of claim 8, further including:

means for positioning two documents on the apparatus; and

means for preventing attempted scanning of the second document if its presence is not detected.

16. A method of determining the size of a document to be reproduced, including the steps of:

(a) placing the document on a surface;

(b) scanning the document along its length by two detecting means, the detecting means indicating the edges of the document by discriminating between light reflected from the document and light reflected by a surface beyond the edges of the document;

(c) determining the direction in which the document will be scanned from a central position on the document in accordance with the length of the document, the initial direction of scanning being toward the nearest end of the document;

(d) scanning the document in accordance with the determination made in step (c); and

(e) calculating the size of the document from information detected by the detecting means.

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L4: Entry 136 of 172 File: USPT Feb 28, 1984

DOCUMENT-IDENTIFIER: US 4433909 A
TITLE: Pivoting reference edge

Application Filing Date (1):
19820322

Detailed Description Text (19):
Still referring to FIGS. 3, 4 and 5, a knob 78 is fabricated on one end of the elongated plate. The function of the knob is to enable the operator to move the elongated plate from the second position away from the platen or vice versa. As is shown in FIG. 4, a numerical scale is fabricated on one surface of the elongated plate. When the plate is on the document platen, the scale can be read and the user merely aligns the size of the sheet with one of the elected scales. This ensures proper registration when the machine is running in the manual mode.

Detailed Description Text (21):
The manual position of the manual registration gate assembly 42 is further determined by a visual indicating means. In one embodiment of the invention the visual indicating means includes a color code which is painted on knob 78. The code comprises different colors which are painted on opposite surfaces of knob 78. By way of example, when the elongated plate is in the manual registration mode (that is on the document platen), a first color painted on surface 80 (FIG. 4) is exposed to the operator. Likewise, when the elongated plate is in the home position, away from the document platen, a second color painted on surface 82 (FIG. 5) of the knob, is visible to the operator. By quickly observing the color which is exposed, the operator can tell whether the plate is on the document platen or is off the platen in its home position. In an alternative embodiment of the present invention, the knob is painted with a single color. Indicating arrows are placed on opposite sides of the knob. The arrows point in opposite directions. The direction in which the arrows point indicates the position of the plate.

Detailed Description Text (25):
Referring now to FIG. 7, there is shown a flowchart which can be used to program the microcomputer. Of course, if the microcomputer was performing another function, the program in FIG. 7 would be a subroutine of the main program. Since the invention is not generally concerned with the overall operation of a copier system, a background overall program is not shown. Only the subroutine which is necessary for the microcomputer to keep check and to generate control signals which inhibit operation of the SADF is shown. The first step in the program is identified by block 102. The block 102 is the entry block wherein the microprocessor reads input at its input terminal. As stated previously, this input is generated by the output from the phototransistor and associated circuitry in jam detection control circuitry 80 (FIG. 6). The microprocessor enters this block when an operator pushes the power button on the SADF operator panel 36 (FIG. 3). This button forces the microcomputer into an interrupt mode wherein it examines the signals which are generated at the input port. The microcomputer next enters operational block 104. In block 104, the microcomputer sets one of its counters (CTR) to a predetermined count. The predetermined count is of a magnitude so that if a paper sheet is passing over the black patch when the manual edge aligner is in the home position,

the sheet would clear the patch before the count is zero. The microcomputer then goes into decisional block 106. In block 106, the microcomputer tests to see if the input is a logical one. If it is a logical one, the microcomputer enters block 108 where it goes back to the background or main program. Incidentally, if the input is one, this means that light is not reflecting from exit path 43 and therefore there is no paper jam in exit path 28 and the manual edge registration assembly is in its home position. If the input is a logical zero (that is not one), the microcomputer enters operational block 110. In operational block 110, the count which was set in block 104 is decremented. The microcomputer then enters decisional block 112. In block 112, the microcomputer checks to see if the count is equal to zero. If it is not equal to zero, the microcomputer enters into a small loop and re-enters block 106. If the input is one, there is no jam and the manual edge aligner is in the home position and the program returns to the main or background program. However, if it is not one (that is zero), this means there is paper in the exit path or the manual edge aligner is on the glass. The program then advances through block 106, 110 and 112 and the loop continues until the count is equal to zero. When the count is equal to zero and the input is zero, the program enters block 114 where it sets the jam flag. This means that there is a jam in the paper path. It should be noted that a jam in the paper path does not necessarily mean that paper is stuck in path 28. It could well be that the manual reference edge aligner is on the platen 26. Once the jam flag is set, the program returns to the main program. With the flag set, a signal is generated which lights the jam indicator 40 (FIGS. 3 and 6) and deactivates operation of the SADF.

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L4: Entry 137 of 172 File: USPT Nov 15, 1983

DOCUMENT-IDENTIFIER: US 4415261 A
TITLE: An improved platen cover for a copying machine

Abstract Text (1):
An improved platen cover for overlying original documents disposed atop a transparent plate for optical scanning in a copying machine includes marks or patterns on its surface facing the transparent plate. The marks or patterns are placed on the platen cover surface utilizing a fluorescent paint so that the marks or patterns do not reproduce on or degrade the quality of the copy of the original document operatively produced by the machine.

Application Filing Date (1):
19810915

Detailed Description Text (15):
A copying machine incorporating such an automatic detection means for the size of the original being copied is disclosed in a Japanese patent application of Koji Yukawa and Takashi Murahashi of the present inventors and Masayuki Miyasaki (Japanese Patent Publication No. 97400/1979, laid-open to public inspection under No. 22424/1981) and is the subject of U.S. Pat. No. 4,338,020. As there described, the detecting means include a member colored in a prescribed color and provided on the side of the platen cover facing the transparent plate, an exposure means by which the colored member is illuminated, and a light receiving section for receiving the reflection of the light applied to the colored member from the exposure means. In use, at least a portion of the light emanating from the exposure means and reflected onto the light receiving section is intercepted or blocked by an original placed on the document glass table, and thus the size of the original can be detected. However, such detecting means presents a problem in that the quality of the copy image is spoiled even where the color of the colored member corresponds to that having the highest spectral sensitivity of the photosensitive substance, because the colored area is copied onto the copy image (this problem is especially serious where the size of the recording paper is larger than the size of the original).

CLAIMS:

1. In a copying machine having a housing, a transparent plate on which an original to be copied is placed, and means for illuminated imaging of the original through the transparent plate and for reflecting an image of the original onto a photosensitive member, an improved platen cover for overlaying the original placed on the transparent plate, the improvement comprising markings on the surface of said platen cover facing the transparent plate and formed of a fluorescent-based material so that when scanning illumination impinging upon those of said markings disposed about the periphery of the overlaid original causes said markings to be reflected onto the photosensitive member, development of the reflected image of the fluorescent-based markings is avoided due to the high reflection characteristics of the fluorescent-based material and copy image integrity is accordingly maintained.

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